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Work Plan

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for

See Draft Final (7/03) for appendices RAC

Remedial Investigation
Site 17
Building 32, Gould Island

Naval Station Newport
Newport, Rhode Island

Environmental Field Activity Northeast
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0842

January 2003

WORK PLAN
Remedial Investigation, Site 17, Gould Island
Naval Station Newport
Newport, Rhode Island

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C-NAVY-01-03-1606W

COPY

January 29, 2003

Project Number 5152

Mr. James Shafer
Remedial Project Manager
EFA Northeast, Naval Facilities Engineering Command
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Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0842

Subject: Draft Remedial Investigation Work Plan
Site 17, Gould Island
Naval Station Newport, Newport Rhode Island

Dear Mr. Shafer:

Enclosed you will find four copies of the Draft Remedial Investigation Work Plan, prepared for Site 17 at Gould Island, Jametown Rhode Island, which is part of the Naval Station Newport.

Please note that electronic copies of the main body of the work plan have been provided to the recipients below on this date.

If you have any questions regarding this material, please do not hesitate to contact me.

Very truly yours,

Stephen S. Parker
Project Manager

SSP/

attachment

c: M. Griffin, NSN (w/encl. - 2)
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File 5152-3.2 (w/o encl.), 5152-8.0 (w/encl. - 1)

W5203279D

WORK PLAN

FOR

REMEDIAL INVESTIGATION
SITE 17
BUILDING 32, GOULD ISLAND

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Environmental Field Activity Northeast
Environmental Branch Code 18
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Submitted by:
Tetra Tech NUS, Inc.
600 Clark Avenue, Suite 3
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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0842

January 2003

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APPENDICES

A Background Summary Report, Site 17
B Health and Safety Plan for Site Inspections
C Selected Standard Operating Procedures
D Field Documentation Forms

1.0 INTRODUCTION

This Work Plan has been prepared under the Comprehensive Long -Term Environmental Action Navy (CLEAN) Contract No. N62472-94-D-0888, Contract Task Order (CTO) 842. The statement of work requires Tetra Tech NUS, Inc. (TtNUS) to provide a Remedial Investigation (RI) Work Plan for the Building 32 area on Gould Island, which is part of Jamestown, Rhode Island. The Building 32 area has been designated as Site 17 through Navy correspondence following the Phase 1 Study Area Screening Evaluation conducted in April 2000. This Work Plan describes the procedures for performing the RI at Site 17.

1.1 BACKGROUND

The purpose of the RI is to determine the nature and extent of contamination associated with the past use and disposal of chemicals and chemical wastes at Site 17. The investigation will focus on environmental contamination at and near the former Building 32 area located on the northern portion of Gould Island in Narragansett Bay. The RI report will be prepared in accordance with general EPA guidance and the Federal Facilities Agreement between the U.S. Environmental Protection Agency (EPA), Rhode Island Department of Environmental Management (RIDEM) and the U.S. Navy.

Site 17 is centered on the former Building 32, which was a Torpedo Overhaul Shop. Building 32 contained an electroplating shop, machine shops, degreasing shops, grinding and buffing shops, and other workshops used for torpedo service and maintenance during the Second World War. Site 17 is currently described as the "Building 32 Area" and its exact boundaries are not yet defined. It is likely that the extent of the site will cover several other known and potential release sites at Gould Island, which include underground storage tanks (USTs), former PCB transformer buildings, and former material storage areas. All above-ground structures in the vicinity were demolished in 2001 and 2002.

Some investigations and removal actions have been conducted at this and other release sites in the area, and a detailed description of these activities is presented in the Background Summary Report, which is presented as Appendix A to this Work Plan. The Background Summary Report describes past industrial activities that apparently resulted in the presence of chlorinated solvents, fuel-related contaminants, and metals in the soil, groundwater, soil gas, and marine sediment at the site, and PCBs in the soil and marine sediments at the site. To determine the nature and extent of these contaminants, as well as the nature and extent of other contaminants that may not yet be identified, the RI will be conducted through a focused program of investigation that is based on previous investigation findings, known and suspected contaminant flowpaths, and site background information.

1.2 WORK PLAN FORMAT

The basic format of this Work Plan reflects that of similar documents provided for regulatory approval under the CLEAN contract for the Newport Installation Restoration Program sites. However, this Work Plan also includes some of the supporting information described in current Navy and regulatory policy and guidance, including (but not limited to) the following:

- Region I EPA- New England Quality Assurance Project Plan (QAPP) Compendium of QAPP Program Requirements and Guidance, October 1999

- U. S. Navy – Policy On Sediment Site Investigation and Response Actions, February 2002

Additionally, the investigation program has been designed to comply with federal and state environmental regulations as well as Navy policy. To the extent possible, this investigation will utilize the principals of rapid assessment described in the document: "Integrating Dynamic Field Activities into the Superfund Response Process" OEER, (5201G).

Section 1.0 of this Work Plan describes the project organization and communication pathways, personnel responsibilities, and a process for revision to the Work Plan during field activities.

Section 2.0 of this Work Plan presents the project planning and project definitions. Within this section, project planning is described, as well as problem definition, site history, site location and description, watershed contaminant source information, data use evaluation and the outline of a conceptual site model.

Section 3.0 presents a description of the data collection activities planned for this RI. This includes a rationale for field investigation design, description of field investigation efforts, and sampling and data acquisition procedures and analysis requirements.

Section 4.0 presents the Quality Assurance (QA) Plan for the RI. This section includes the project quality objectives, project action limits, and measurement performance criteria. Also included in Section 4.0 are discussions of: sample collection documentation requirements; the sample identification system; sample handling and custody; analytical method requirements; sampling and analytical quality control; analytical documentation and data management; data validation and verification requirements and procedures; and QA assessment and management efforts.

Section 5.0 presents a general outline of the RI report, the human health risk assessment and the first tier of the ecological risk assessment that will be prepared following completion of the field work described in Section 3.0.

Section 6.0 presents references cited and used in preparing this Work Plan.

As stated previously, the Site Background Summary Report is provided as Appendix A. A site-specific Health and Safety Plan is attached as Appendix B. Appendix C presents Standard Operating Procedures (SOPs) for the field investigation work. Appendix D contains samples of forms to be used for documentation during this investigation.

1.3 PROJECT ORGANIZATION AND RESPONSIBILITIES

TtNUS will be responsible for the overall management of the project, including the performance of field activities presented in this Work Plan.

Navy personnel from the Environmental Field Activity Northeast (EFANE) will be responsible for administrative and technical oversight of the program, and project management and coordination between state and federal regulatory agencies, while the Navy personnel from the Naval Underwater Warfare Center (NUWC) and Naval Station Newport (NSN) will be responsible for on-site coordination with TtNUS.

Key Navy personnel supporting this project are as follows:

James Shafer, Remedial Project Manager (RPM)
EFANE, Philadelphia, PA Phone: 610-595-0567 FAX: 610-595-0555

Melissa Griffin, Facility Contact, NSN PWD – Environment
Building 1 Phone: 401-841-6375 FAX: 401-841-7071

Philip DeNolfo, NBSWTF Manager, NUWC

Joann Spangenberg, NUWC DIVNPT Environmental, Safety and Security

Key TtNUS personnel supporting this project are as follows:

Stephen Parker, Project Manager
TtNUS, Wilmington, MA Phone: (978) 658-7899 FAX: (978) 658-7870

Lauren Seydewitz, Field Operations Leader
TtNUS, Wilmington, MA Phone: (978) 658-7899 FAX: (978) 658-7870

Kevin O'Neill, Lead Biologist
TtNUS, Wilmington, MA Phone: (978) 658-7899 FAX: (978) 658-7870

Cynthia Woods, Lead Risk Assessor
TtNUS, Wilmington, MA Phone: (978) 658-7899 FAX: (978) 658-7870

Kelly Johnson-Carper, Lead Chemist, Program Quality Assurance Manager
TtNUS, Pittsburgh, PA Phone: (412) 921-7090 FAX: (412) 921-4040

Michael Healey, Lead Geologist/Hydrogeologist
TtNUS, Wilmington, MA Phone: (978) 658-7899 FAX: (978) 658-7870

Matt Soltis, CLEAN Health and Safety Manager
TtNUS, Pittsburgh, PA Phone: (412) 921-7090 FAX: (412) 921-4040

The TtNUS Project Manager (PM) will have the primary responsibility for implementing and managing the investigation. The TtNUS PM will also be responsible for notifying regulatory agencies of field activities or schedule modifications.

The Field Operations Leader (FOL) will be responsible for directing on-site field activities and will report directly to the PM. The FOL will coordinate efforts of the field sampling staff, the subcontractors, and the lead technical staff. The FOL will be responsible for identifying problem areas and bringing them to the attention of the PM for resolution.

The Lead Biologist and Lead Risk Assessment personnel will be responsible for reviewing the sampling program to ensure it is adequate to meet the objectives of the study, for assimilating the data into a format amenable to manipulations required for risk assessment modeling and calculations, and for performing the risk assessment steps.

The Lead Chemist will advise the PM on technical requirements of the chemical data, prepare laboratory specifications for analysis of samples collected, oversee the subcontracted analytical laboratories, and review or oversee the validation of the analytical reports prepared.

The Lead Geologist/Hydrogeologist will advise the PM and FOL regarding the interpretation of the subsurface materials encountered, location of borings and wells to be installed, and behavior of contaminants based on those subsurface materials and anticipated groundwater movement.

The CLEAN Health and Safety Manager is responsible for reviewing health and safety plans for all CLEAN operations, and performs site audits to ensure compliance with program and site health and safety requirements.

The Quality Assurance Manager is responsible for QA/QC requirements for the TtNUS CLEAN program. This individual reviews data and deliverable documents, and performs system audits to ensure contract QA/QC goals are met.

A Site Safety Officer (SSO) will be designated prior to field activities and will be responsible for ensuring adherence to the site-specific Health and Safety Plan. The SSO reports directly to the CLEAN Health and Safety Manager and the PM.

In addition to the above personnel, TtNUS program personnel will provide overall support in subcontracting, cost tracking, progress reporting, and supervising the PM. The program personnel include:

John Trepanowski, P.E., Program Manager
TtNUS, King of Prussia, PA Phone: (610) 491-9688 Fax: (610) 491-9647

Garth Glenn, P.E., Deputy Program Manager
TtNUS, King of Prussia, PA Phone: (610) 491-9688 Fax: (610) 491-9647

1.4 CHANGES TO THE WORK PLAN

Work Plan development is performed in steps, with the Navy providing draft, draft final, and final versions to oversight parties to allow for comments and other input. However, during the project execution, it may become necessary to modify the Work Plan after it is finalized. If the plan for collecting data needs to be altered, the Work Plan may be amended through the use of a Request for

Field Modification (RFM) form. This form will be prepared by the TtNUS FOL and forwarded to the TtNUS PM. The PM will make a recommendation to the Navy RPM, who will forward the RFM to NSN and NUWC representatives, and to the regulatory oversight RPMs. Time limits on acceptance of, or comment to, the field modification requests will be stated.

When changes require immediate action, the proposed change will be implemented at the discretion of the TtNUS project manager in order to avoid schedule delays, cost impacts, and/or subcontractor standby times. The Navy and regulatory agencies will be notified through delivery of the RFM as described above.

An example of the RFM form is presented in Appendix D.

1.5 SCHEDULE AND REGULATORY OVERSIGHT

A schedule for field investigations will be prepared and submitted to the oversight parties upon development of a cost/schedule proposal to perform the field work. This schedule will be updated as necessary to inform oversight personnel when different tasks and activities are scheduled to occur. A 24-hour advance notification of changes in scheduled field activities will be given to the regulatory agencies. Oversight parties will likely be required to provide their own transportation to and from the site, due to contract structure and potential liabilities for water travel.

2.0 BACKGROUND INFORMATION

This section presents the project planning effort and project definitions. Within this section, the site location and description, site history, watershed contaminant source information, data use evaluation, problem definition and the outline of a conceptual site model are presented.

2.1 SITE LOCATION AND DESCRIPTION

Gould Island is located in the East Passage of Narragansett Bay in Rhode Island, approximately 1.5 miles from the NETC shoreline. Gould Island is located between Aquidneck and Conanicut Islands, and occupies approximately 52 acres (Figure 2-1). Building 32 (Site 17), located on the northeast end of Gould Island, served as a torpedo overhaul shop that has been inactive since the 1950's (Figure 2-2).

Appendix A of this Work Plan presents a detailed summary of the Building 32 area (the Site). This summary includes a physical description of the area, the buildings that were present there, a history, and a summary of environmental investigations and removal actions conducted at the Site.

To summarize from Appendix A, the Site is located on the north portion of Gould Island, and occupies approximately 6 acres of land. In 2001 and 2002, the buildings on the Navy-held portion of Gould Island were demolished to the existing grade, with the at-grade slab foundations left in place. Some of this demolition material was used to backfill an excavation area at the former Building 44 area, and the remainder was moved offsite for land disposal elsewhere.

The north end of Gould Island where the Site lies is a weathered point, subject to prevailing wind exposure and currents almost year round. Sedimentation is not evident in the intertidal areas, but some may have occurred in the boat basin adjacent to the firing pier. The intertidal shoreline is subject to wave action and consists of a mixture of rotted steel sheetpile wall and a stony beachface.

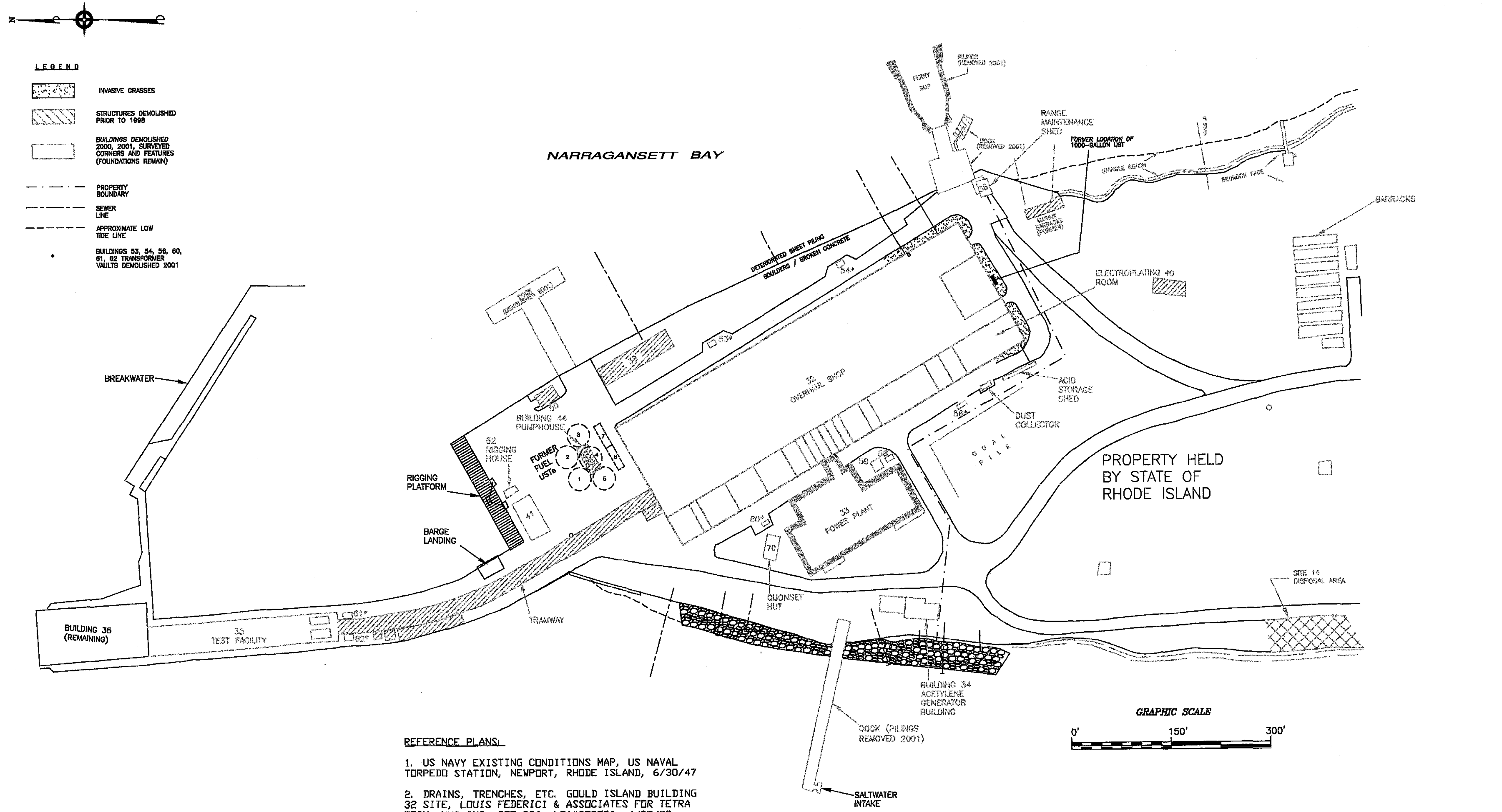
The subject of this RI is the Building 32 area, and lacking further definition, the investigation area is generally discussed as the area on the north end of the island. This area was developed from coastal agricultural land in the early 1940s. At the east shoreline of the island (south of the Site), the overburden is very thin or nonexistent, and bedrock is exposed in places and eroding under the normal wave action, Forming a shingle style beach face (Figure 2-3). Bedrock is undulating, brittle, and highly fractured, allowing available water to seep through the fractures. There is no pervasive dip or strike to the exposed bedrock on the east shore, due to the extreme undulations.

BASE MAP IS A PORTION OF THE FOLLOWING 7.5 X 15 MINUTE U.S.G.S. QUADRANGLE:
PRUDENCE ISLAND, RHODE ISLAND, 1955, PHOTOREVISED 1970 AND 1975

GRAPHIC SCALE
0 0.5 MILE 1 MILE

QUADRANGLE LOCATION

SITE LOCUS			FIGURE 2-1
SITE 17, GOULD ISLAND			TETRA TECH NUS, INC.
NAVSTA NEWPORT, RHODE ISLAND			
DRAWN BY: D.W. MACDOUGALL	REV.: 0		55 Jonspin Road Wilmington, MA 01887 (978)658-7899
CHECKED BY: S. PARKER	DATE: DECEMBER 27, 2002		
SCALE: AS NOTED	ACAD NAME: DWG\5152\0430\FIG_2-1A.DWG		



REFERENCE PLANS:

1. US NAVY EXISTING CONDITIONS MAP, US NAVAL TORPEDO STATION, NEWPORT, RHODE ISLAND, 6/30/47

2. DRAINS, TRENCHES, ETC. GOULD ISLAND BUILDING 32 SITE, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC. CTO 286, LFA#970706, 4/25/00

3. GEOTECHNICAL SURVEY PLAN AT FORMER BUILDING 44 AND 32, US NAVAL BASE ON GOULD ISLAND, LOUIS FEDERICI & ASSOCIATES FOR BROWN & ROOT ENVIRONMENTAL, 9/8/97, DWG#970706-03

4. LOCATION OF MONITORING WELLS AT BUILDING 32 - GOULD ISLAND, U. S. NAVAL BASE NEWPORT, RHODE ISLAND, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC., 5/9/00

NOTES:

1. PLAN NOT TO BE USED FOR DESIGN.
2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
3. PHYSICAL FEATURES SHOWN MAY NOT DEPICT CURRENT CONDITIONS

BASE MAP				FIGURE 2-2
SITE 17, GOULD ISLAND				TETRA TECH NUS, INC.
NAVSTA NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	S. PARKER	DATE:	JANUARY 23, 2003	
SCALE:	AS SHOWN	FILE NO.: DWG\5152\0430\FIG_2-2.DWG		

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FIGURE 2-3
PHOTOS OF EAST SHORE, GOULD ISLAND
MARCH 1997

SHORELINE EAST OF BUILDING 32
AT LOCATION OF FORMER ELECTROPLATING ROOM DRAIN OUTFALL
(VIEW IS TO THE NORTH)

EAST SHORELINE SOUTH EAST OF BUILDING 32
SHOWING BEDROCK OUTCROPS AND STONY BEACH IN PREVIOUS FILL AREA
(VIEW IS TO THE SOUTH)

2.2 SITE HISTORY

Gould Island was purchased in the 1920s and was developed in the 1940s as a weapons support center for naval vessels. Ownership of the southern three-fourths of the island was recently transferred to the State of Rhode Island. Naval Station Newport (NAVSTA) retains ownership of the northern section. A fence separates the two properties, as shown on Figure 2-2.

To summarize from Appendix A, the Site housed electroplating, machining, parts washing, buffing, grinding, and heating plant operations during the 1940s and 1950s. Other structures on the NAVSTA property included transformer buildings, an acetylene generator building, administration building, and various structures used for loading and unloading personnel, torpedoes, and other material from small vessels.

A number of targeted environmental investigations and removal actions have been performed to date, as described in Appendix A. Based on the documentation from these efforts, the following environmental conditions are likely to exist:

<u>Groundwater Contamination</u> – Groundwater appears to contain low concentrations of petroleum, chlorinated solvents, Polycyclic aromatic hydrocarbons (PAHs), and metals. Low concentrations of these contaminants are currently known to exist in the former Building 44 area. Groundwater movement at the Site is likely to reflect surface topography, discharging to the bay, which surrounds the Site on three sides.

<u>Vadose Zone Contamination</u> – Chlorinated solvents, toluene, and PAHs were found in soil gas samples from the vadose zone in the area north of Building 32 in 1997, and under the Building 32 foundation in 2000.

<u>Soil Contamination</u> – Soils containing PCBs at concentrations below 10 (mg/kg), are likely to be present at the former locations of support structures within Site 17, including Buildings 52, 53, 54, 56, 59, 60, and 61.

<u>Sediment Contamination</u> – Based on historical records, wastes from solvent cleaners and electroplating operations were likely discharged to Narragansett Bay from the east side of Building 32 through a floor drain system.

2.3 WATERSHED CONTAMINANT SOURCE INFORMATION

This section has been prepared in accordance with the Navy/Marine Corps Installation Restoration Policy on Sediment Investigation and Response Actions, dated February 8, 2002. The Department of the Navy has installations along water bodies that are impacted by multiple activities, including municipal and private industrial entities. The aforementioned guidance document states the policy on sediment investigations and response actions to be implemented in the restoration of the Navy's Installation Restoration (IR) sites. Site 17, the subject of this Work Plan, has been designated as an IR site by the Navy. This section provides a baseline of information for the watershed area, and contaminants that might be expected even without the presence of the Site.

2.3.1 Description

This section details the physical features of Narragansett Bay, including the extent of the watershed, the geology and hydrogeology of the Bay and the hydrodynamics within the Bay. A description of the biological receptors is discussed as well.

Narragansett Bay is a large estuary, that is, a region where fresh water and ocean water interact, resulting in a brackish environment with a salinity range of 0.5 to 30 parts per thousand (ppt). The estuarine environment is highly productive for a variety of species since the deep water tidal habitats and adjacent tidal wetlands provide a complex and interrelated web of habitats defined by geology, river-flows and tides. These factors affect the composition, distribution and productivity of the biological communities that comprise the estuary. In addition, factors such as climatological forces and more recently, anthropogenic influences, have impacted the physical, chemical and biological composition and contribute to the present day estuary, Narragansett Bay.

2.3.1.1 Watershed

The Narragansett Bay watershed covers a land area of 1,853 square miles, which is more than 10 times the area of the Bay. Approximately 60 percent of the watershed is located in Massachusetts and 40 percent in Rhode Island. The three most significant tributaries to the Bay are the Blackstone, Taunton and Pawtuxet Rivers, which contribute an estimated 2.1 billion gallons of freshwater daily to the Bay. Currently, there are 100 cities and towns located within the watershed and the population density averages 1,100 persons per square mile.

2.3.1.2 Geology and Hydrogeology

Regional geologic information pertinent to the Work Plan for Remedial Investigation at Site 17 is presented below. Much of the regional geologic information was presented in the Draft Final RI report for the Old Firefighting Training Area prepared by Tetra Tech NUS, Inc. (2000).

Regional and Local Overburden Geology

The geology of the region, in general, consists of glacially-derived unconsolidated deposits overlying Pennsylvanian age sedimentary bedrock (USDA 1981; Hermes et al 1994). Wisconsin-age glaciers covered the region with ice several thousand feet thick. During ice advances, sediment and bedrock were eroded and carried beneath the ice sheet. As the glaciers melted and receded, unconsolidated glacial materials of variable thickness were deposited throughout the Narragansett Basin area. These glacial materials included till and sorted sand, silt, and gravel (USDA, 1981; EEI, 1983).

Till is the most extensive of the glacial deposits in Rhode Island. This deposit is unstratified and widely heterogeneous in grain size distribution, typically comprised of fine (clay/silt/sand) and coarse (pebbles/cobbles/boulders) fractions (USDA 1981). In southern New England, the late Wisconsinan surface till is predominant. Published reports indicate that the surface till forms a discontinuous mantle over bedrock uplands and beneath stratified drift deposits. In general, the surface till comprises a loose sandy unit containing boulders and cobbles, and lenses of stratified sediments. However, surface tills vary in composition. The physical characteristics of surface till generally reflect local bedrock and older surficial materials from which the deposit was derived (Melvin et al, 1992).

Regionally, the Upland till plains, the Narragansett till plains, and the Charlestown and Block Island end moraines are till deposits in Rhode Island. NAVSTA Newport is located on the Narragansett till plain. This glacial till deposit may have been derived from a sedimentary and meta-sedimentary rock provenance (USDA, 1981).

Stratified drift or outwash, composed of sorted sand, silt, and gravel deposits, were laid down by glacial meltwaters as the ice sheet receded. The eroded materials carried by the glacial meltwater were deposited in irregular layers of various thicknesses. Regionally, large deposits of outwash are located in Providence and East Greenwich (USDA, 1981).

Soils found on Gould Island are classified as Newport Series by the Soil Survey of Rhode Island. These soils are formed in compact glacial till derived from dark sandstone, conglomerate, argillite, and phyllites. Permeability is generally moderate at the surface and low in the substratum (B&RE, November 1997).

Regional and Local Bedrock Geology

Narragansett Basin is an ancient structural basin originating near Hanover, Massachusetts. This basin is a complex synclinal mass of Pennsylvanian aged, non-marine sedimentary rock, and is the most prominent geologic feature in eastern Rhode Island and adjacent Massachusetts. The basin's approximate length is 55 miles; its width varies from 15 to 25 miles. The western margin of the basin is in the western portion of Providence, Rhode Island, and the eastern margin extends through Fall River, Massachusetts. Exposures of older rocks on Conanicut Island and in the vicinity of Newport suggest that the southern extent of the basin may be near the mouth of Narragansett Bay. Gould Island is situated at the southeastern end of the Narragansett Basin (EEI, 1983).

The rocks within Narragansett Basin chiefly consist of conglomerates, sandstones, shales, and anthracite. Total thickness of the strata in the basin has been estimated at 12,000 feet. Many folds and some faults occur throughout the basin, but the character and amount of the folding and faulting was not evaluated as part of this report. Refer to Hermes et al (1994) for a depiction of the faults mapped in the surrounding area.

The bedrock of the Narragansett Basin has been divided into six units, including the Purgatory Conglomerate and the Rhode Island Formation, which underlie Gould Island (Hermes et al, 1994). The contact between the two units has been mapped as crossing the eastern portion of the Site in a north-south direction. Refer to Hermes et al (1994) for a detailed depiction of the bedrock geology of Rhode Island.

The Purgatory Conglomerate is a buff to pale-gray conglomerate consisting of pebbles, cobbles, and boulders comprised of quartzite, with a matrix of primarily quartz. Some of the cobbles and boulders have been elongated as a result of tectonic forces in the southern portion of the basin (Hermes et al, 1994).

The Rhode Island Formation is the most extensive and thickest of the Pennsylvanian formations in Rhode Island. The majority of the Narragansett Basin is underlain by this formation. In northern Rhode Island, the Rhode Island Formation is not metamorphosed and primarily consists of gray to black, fine- to coarse-grained quartz arenite, litharenite, shale, and conglomerate. However, in the southern portion of the basin, such as in the vicinity of NAVSTA Newport, this unit has been metamorphosed.

Metasedimentary rocks, including metaconglomerates and metasandstones, as well as schist, carbonaceous schist, phyllites, and graphite are present within the formation (Hermes et al 1994).

No bedrock exposures have been observed at the northern end of Gould Island. However, bedrock is exposed south of the former Building 32 on the east side of the island, along the shoreline. Bedrock in the vicinity of Gould Island is mainly metamorphic rock, predominately phyllites and schists, which are exposed at outcrops at the main-base area of NETC, approximately two miles to the east of Gould Island.

Regional and Local Surface Water Hydrology

All surface water drainage from the Narragansett Bay watershed empties into Narragansett Bay. Gould Island, located in Narragansett Bay, is a part of the Bay's watershed. At Site 17, precipitation either evaporates, infiltrates the soil or flows overland towards the Bay. Surface water runoff enters the Bay as a result of direct overland flow or as discharge from the existing stormdrain network located on the Site.

Regional and Area Surface Water Classifications

All surface waters of Rhode Island have been categorized according to water use classifications considering public health, recreation, propagation and protection of fish and wildlife, as well as economic and social benefit. According to RIDEM's Water Quality Regulations and Water Quality Classification Descriptions, each class is defined by the most sensitive water uses to be protected (RIDEM, 1997). Generally, all waters shall be suitable for aquacultural uses, navigation, and industrial cooling, and have good aesthetic value.

Most of Narragansett Bay, including the area surrounding Gould Island, is described as Class "SA". This water quality classification denotes the water quality goal for the waterbody. Class "SA" seawaters are designated for shellfish harvesting for direct human consumption, primary and secondary contact recreational activities, and fish and wildlife habitat (RIDEM, 1997).

Site Surface Water Hydrology

No surface water bodies are present on Site 17, though it is bounded on 3 sides by Narragansett Bay. The general site topography slopes slightly from the southwest to the northeast. Narragansett Bay surrounds Gould Island and borders Site 17 to the north, east and west. The shoreline consists of mainly manmade materials, including concrete slabs, degrading steel and wooden pilings, and building rubble. There is a sandy beach at the far southern point of Gould Island. Surface water runoff (precipitation) from the Site either evaporates, infiltrates into the Site soils, ponds on-site, or flows directly into the Narragansett Bay. Surface water runoff generally flows from southwest to northeast across the Site. Remaining building foundations, asphalt-paved roads, and an existing storm drain network beneath the Site redirect the surface water flow before it is discharged into Narragansett Bay.

Wetlands

Gould Island is designated an upland area. Published maps do not indicate the presence of wetlands on the island (USDOI, 1975).

Groundwater Hydrogeology and Groundwater Classifications

The groundwater hydrogeology and groundwater classifications for Site 17 are presented in the Background Summary Report (Appendix A, Section 2.5.2).

2.3.1.3 Hydrodynamics

Narragansett Bay is composed of three distinct north-south oriented, interconnected branches: West Passage, East Passage and the Sakonnet River. The Bay is 25 miles long and 10 miles wide, with a surface area of approximately 132 square miles at mean low water. The average depth of the Bay is 29 feet and the maximum depth, located within the lower East Passage, is 188 feet.

Narragansett Bay is a temperate, partially to well mixed estuary with an average salinity of 29 to 31 ppt. This is less than the salinity of seawater at 35 ppt. A salinity gradient extends from the head (Upper Bay) to the mouth of the Bay, with the lowest salinity levels present in areas of fresh water tributary discharge. Narragansett Bay is bound by fresh water inputs from the north and the salty inner shelf water of Rhode Island Sound to the south.

Circulation patterns within the Bay are generally north to south and are driven by competing tidal, wind and density forcing (URI and SAIC, 1995). Tidal forces interact with a highly variable bottom topography and result in a well mixed estuary. The mean flushing time for the Bay is 26 days (Ely, 2002) and the fresh water discharge from watershed tributaries varies between a minimum of 20 m^3/s in late summer-fall to >300 m^3/s in winter-spring months (URI and SAIC, 1995). Primarily, circulation in the Bay is driven by tides, and secondary circulation patterns result from wind forces (Weisberg 1976; Weisberg and Sturges 1976; Gordon and Spaulding 1987). The prevailing wind direction changes seasonally and is generally from the southwest in the summer and the northwest in the winter.

The General NOAA Oil Modeling Environment (GNOME) model, a hypothetical spill model used by the US Coast Guard to predict contaminant spill distribution, was applied to determine the hydrodynamic response and the possible trajectory of sediment deposition within the Bay. The model integrates information for local oceanographic conditions including current patterns, relevant climatological and tidal information to simulate a response to selected parameters. The input parameters include wind (the velocity, direction, and consistency), contaminant selection and time scale.

GNOME is primarily utilized to generally predict the distribution of petroleum contaminants within a certain area for a specified amount of time. The precision of the modeled outcome is unknown, though "uncertainty estimates" of the modeled trajectory is provided for additional analysis. Modeled parameters include an assumed density of the selected contaminant particles and the contaminants to be biodegradable. Contaminant-specific physical and chemical properties are not generally accounted for in the model. There are limitations to selected parameters that affect how true-to-life the modeled trajectory will be.

According to the GNOME model, Narragansett Bay is a high-energy system. Contaminants move quickly throughout the system and are diluted in a short amount of time, depending on the physical and chemical properties of the contaminant. Depositional patterns coincide with the general north-south flow gradient and are highly affected by storm events and significant changes in wind patterns. Modeled scenarios had considerable dispersion of contaminants throughout a wide area of the Bay within a short amount of time.

Sediment Deposition

Sediment deposition is a continual process that occurs in areas of less kinetic energy, including coves, inlets and protected areas. Depositional areas are located at the inlets of tributaries into the Bay and in areas where topographic surface features form a barrier to sediment flow. Sediment movement is to the south as a result of circulation patterns within the Bay. Generally, the surface sediments of Narragansett Bay are silty sand, as determined by a study of samples collected from 942 stations by McMaster (1990). Some contaminants such as metals and PCBs adhere to sediment particles. It is therefore possible to use observed sedimentation to determine the origination of an attached contaminant. Layered sediment particles in stable depositional areas can be analyzed for contaminants to identify the age of deposition and then correlated with known historical records to determine the source. However, the disturbance of deposited, contaminated sediments during severe storms or dredging projects, re-suspends the contaminants and sediments in the water and renders this type of evaluation more difficult (RIDEM, 2000).

2.3.1.4 Receptors

Narragansett Bay and the life that it supports are both economically and ecologically important. There are sixteen listings for threatened and endangered species in the State of Rhode Island (U.S. Fish & Wildlife Service, 2002). According to the Rhode Island Natural Heritage Program (Enger, 2002) there is low potential for habitation of federal or state endangered or threatened species in Narragansett Bay. The species that have been identified as target receptors of concern within the Bay include: the snowy egret (Egretta thula), the great blue heron (Ardea herodias), the herring gull (Larus argentatus), the American Oyster Catcher (Haematopus palliatus), and in general, colonial nesting birds. These birds are not identified on the federal or state endangered or threatened species list for Rhode Island (RIDEM, 1999).

The commercial and recreational fisheries associated with the Narragansett Bay drainage basin are valued at several million dollars (NOAA, 2002). Specifically, the Bay's commercially important species include: demersal and pelagic fish, shellfish, lobster and squid. Of the demersal fish in the Bay, the winter and summer flounder, tautog and black sea bass are of interest, in addition to the pelagic fish species, bluefish, striped bass, scup, squeteague, menhaden, Atlantic herring and alewife. Quahogs and oysters are also commercially significant (Ely, 2002).

Areas in the Lower East Passage are intensely fished, especially for lobster. Approximately 20 percent of the Bay's area is permanently closed to shellfishing and an additional 11 percent of the Bay has "conditionally approved" areas that are closed after heavy rains (Ely, 2002). A permanent closure area due to pollution is located in the East Passage and downstream of Gould Island. Bivalve species (clams, mussels, oysters, etc.) are the only species included in the shellfish management area bans, allowing collection of crab, lobster, and finfish.

Keystone organism populations include eelgrass, algae and plankton. The status of these species is an indication of the overall health of the Bay. There are no significant eelgrass beds north of Jamestown (RIDEM, April 2000). Eelgrass is a critical refuge habitat for benthic organisms. Plankton are the basis for the Bay's food web while algae is used more as an indicator of the level of available nutrients. Algael blooms generally result from an increased level of available nutrients in the system. The effect of such a bloom can have a significant impact on the chemistry of the water and in turn, affect the rest of the nutritional ladder.

The relationship between benthic organisms and sediment type is separated into two dominant habitats in the lower Narragansett Bay and adjacent Rhode Island Sound. The first habitat, Lower Bay Complex, consists of a mixture of sediments containing sand and has an abundance of Mytilus (mussel) and

Crepidula (slipper shells) shells. The mid-estuarine and estuarine-offshore species found in this habitat are Pherusa affinus (deposit feeding polychaetes), Aricidea (polychaetes), and Ampelisca vaderum (amphipod crustacean) (French et al, 1992). The second habitat, Marine Silty Sand, is typical of Rhode Island Sound and extends into the East Passage. The benthic fauna are characterized by such marine species as Astarte (bivalve), Cyclocardium (bivalve), Byblis serrata (amphipod), and Arctica islandica (bivalve) (Quinn et al, 1995).

The amphipod populations of Leptocheirus pinguis and Casco bigelowii are abundant in sand to silty sand sediments of the Lower East Passage. The burrowing activities of these organisms create a soft, high-water content and well-oxygenated sedimentary environment, which results in the mixing of the sediment surface and the overlying water column. (Quinn et al, 1995)

2.3.2 Contaminants Present

In considering the large size and location of the watershed, contaminants are likely introduced to the system from point and nonpoint sources. This section provides a general overview of the regional contaminants and their sources.

2.3.2.1 Regional Sources

The Narragansett Bay watershed is one of the most populated watersheds in the country, with an average of more than 1,100 persons per square mile. The Blackstone River, a tributary to the Bay, was the location of the start of the Industrial Revolution in the United States in the 1700's. During the Industrial Revolution, textile mills were situated along the tributaries to the Bay and there was a population shift to the cities to support the developing textile industry. The machine tools industry then expanded in support of the rapid industrialization that occurred during the 1800s. At the time of the Civil War, production of armaments in factories located on the tributaries increased and was then followed by the expansion of the jewelry and silver industries after World War II. The net result of the industrialization and the untreated sewer and industrial discharges of the watershed drainage basin area was an increase in the input of metals and other toxic substances to the Bay (RIDEM, 2000).

Regional sources of contamination to Narragansett Bay include 7,624 Resource Conservation and Recovery Act (RCRA) sites located within the drainage basin. According to the Environmental Protection Agency's National Priorities List (NPL), eleven sites in Rhode Island and six in Massachusetts are within the limits of the watershed and are of specific concern. These sites are identified as having inorganics, metals, PAHs, PCBs, petroleum hydrocarbons, petroleum naphtha and VOCs as the contaminants of concern in sediment and/or surface water (USEPA, 2002). While VOCs and lighter fractions of SVOCs will dilute and volatilize, PCBs, heavier molecular weight PAHs, and some metals are persistent and will be transported down-bay with fine grain sediments.

Narragansett Bay receives effluent from wastewater treatment facilities and discharge from combined sewer overflows (CSOs) and industries. There are 33 wastewater treatment plants in the Narragansett Bay watershed (Ely, 2002). CSOs are the discharges resulting from the combined sanitary sewers and storm drains that were constructed to manage both stormwater and sewage in urban areas. During heavy rains, the stormwater flow exceeds the capacity of the wastewater treatment facility and all of the flow, including untreated human waste, is discharged directly to the Bay via the CSOs. CSOs are a significant source of nutrient loading, including nitrogen, for the Bay (RIDEM, 2000).

The pretreatment of industrial wastes has decreased the amount of metals and other toxic substances entering the wastewater treatment facilities. Correspondingly, there has been a decrease in the discharge of metals concentrations into the Bay over the past 15 to 20 years, due to government regulations (RIDEM, 2000).

There are PCBs known to be present in the sediments of the Bay and of the rivers feeding the Bay. Sampling conducted by the USEPA on the Woonasquatucket River found concentrations of PCBs in the associated sediments and fish tissues, in the reaches from Johnston to Providence. The Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET) performs periodic monitoring of sediments in the upper reaches of the Narragansett Bay estuary, upstream of Gould Island, and their monitoring work has repeatedly identified PCBs in sediment samples exceeding the NOAA effects-range median (ERM) benchmark of 180 ug/kg.

Arsenic has been found to be present in soils and sediment in the region at concentrations exceeding the RIDEM direct exposure criteria. Arsenic is a naturally occurring toxic element, typically found in natural soils between 1 and 20 mg/kg, depending on the parent materials. Some coal-like rock types found in Rhode Island can contain significant concentrations of arsenic-bearing materials. The soil overlying the bedrock in Rhode Island is anticipated to contain varying concentrations of arsenic, depending on the parent materials and other factors. Manmade sources of arsenic include coal and coal ash, agricultural chemicals, and chemicals used in tannery operations (Kowalski et. al., 1999).

Lead contamination in the Bay is one specific example of the effect of human activities. During the Industrial Revolution, lead was used to help fix the dyes as part of textile manufacturing. The manufacturing of machinery contributed even more lead to the rivers flowing into the Bay. Another significant source of lead was from gasoline before it was required to be unleaded. Government regulations combined with an increase in technology and environmental awareness have limited the amount of metals, including lead and other contaminants, from entering the Bay (Ely, 2002).

2.3.3 Summary

As described elsewhere in this section, some classes of contaminants are more persistent in the environment than others, and may behave differently. PCBs, high molecular weight PAHs, and metals tend to be more stable, adhere to soil or sediment particles, and therefore are more readily found in depositional sediment areas. VOCs and the lighter SVOCs are more soluble in water and are likely to dilute out or be metabolized by microorganisms. As the site in question is in a relatively remote portion of the estuary, the contaminants that may have come to be located near it are likely those that are more persistent in the environment, that is, PCBs and metals. Arsenic is likely to be present in ubiquitously elevated concentrations, and VOCs and lighter SVOCs that are found are very likely to be site-related, and not from regional conditions.

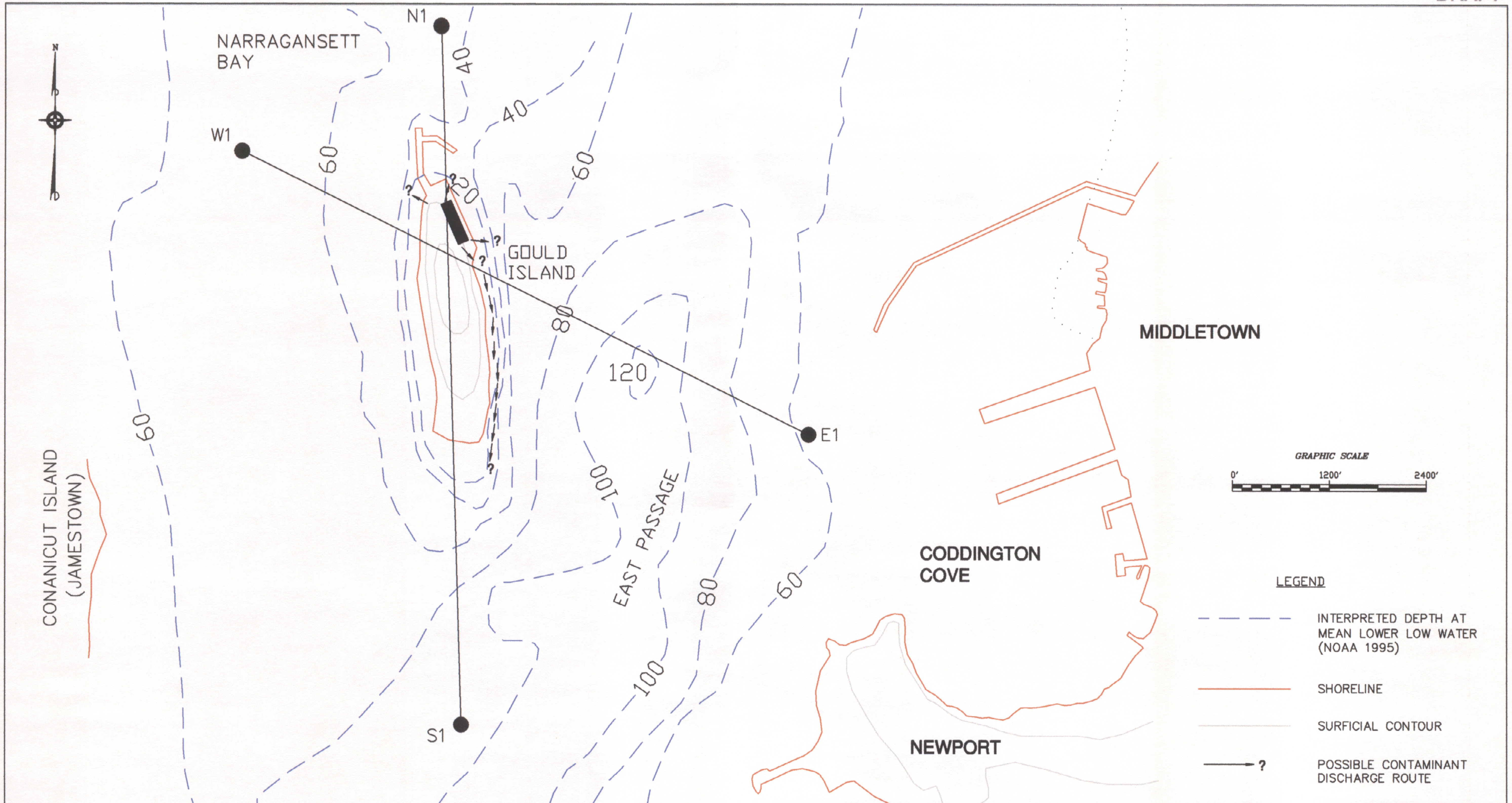
2.4 CONCEPTUAL SITE MODEL

Using the information provided in Appendix A and Sections 2.1 through 2.3, a conceptual site model has been developed to better understand how contaminants discharged at and near the Site would likely behave and interact with the surrounding soil, water and bedrock. This understanding will direct the development of the investigation, and the plan for that investigation.

A conceptual model for this Site has been developed around three two-dimensional views of the Site and its surrounding landforms. Some of the information required for a conceptual Site model is not yet known, and is therefore estimated. Figure 2-4 provides the first view, which is an overhead view of the Site and its surroundings.

Figure 2-5 presents a cross-section bisecting the site from east to west (view to the north). This figure is a scale drawing of the landform that makes up the island and the east passage of Narragansett Bay. Figure 2-6 presents a second cross-section from south to north (view to the east).

These figures show possible contaminant flow paths based on the information available on the Site to date. The pertinent information is presented below, according to chemical groups. Contaminants discussed in the sections that follow are known or suspected to exist at the Site, as described in Appendix A of this Work Plan.



NOTES:

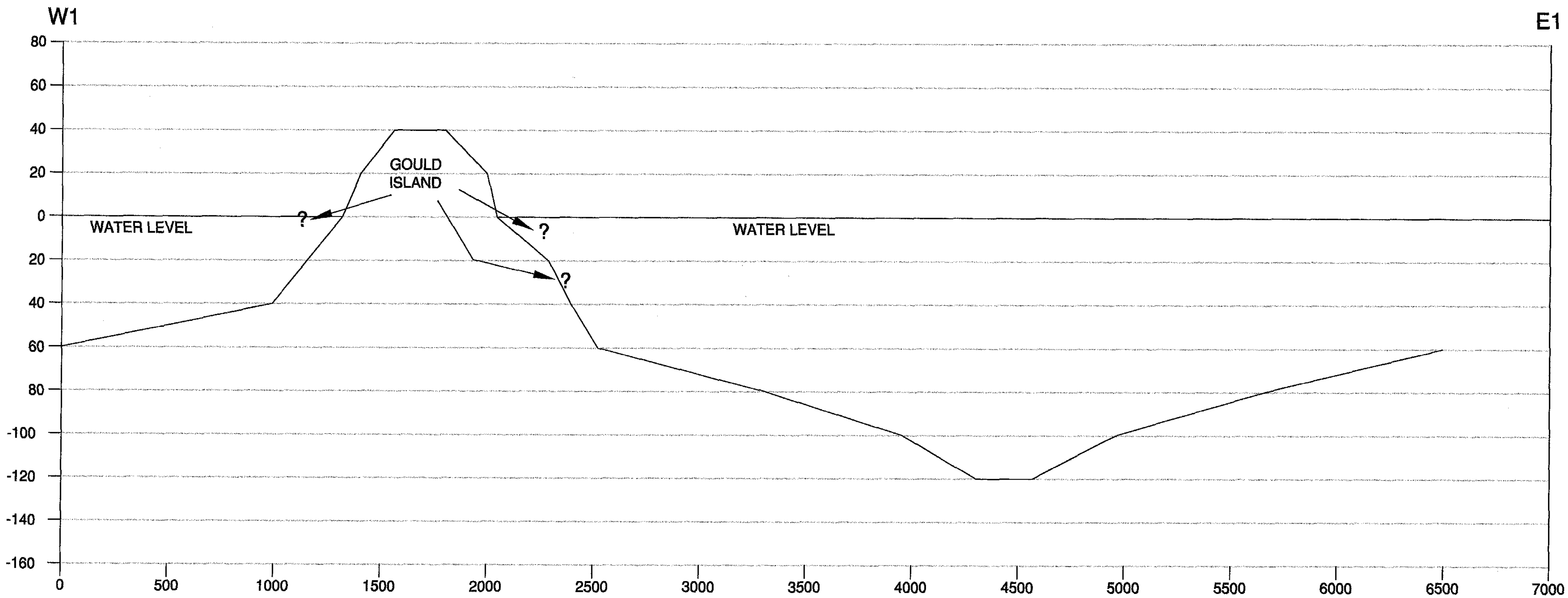
1. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. BOTTOM CONTOUR DATA INTERPRETED FROM NOAA CHART 13221, APRIL 15, 1995.

MEAN LOWER LOW WATER CONTOURS				FIGURE 2-4
SITE 17, GOULD ISLAND				TETRA TECH NUS, INC.
NAVSTA NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	L. SEYDEWITZ	DATE:	JANUARY 23, 2003	
SCALE:	AS SHOWN	FILE NO.:	DWG\5152\0430\FIG_2-4.DWG	

DRAFT

LEGEND

? ← POSSIBLE CONTAMINANT DISCHARGE ROUTE



HORIZONTAL GRAPHIC SCALE

0' 500' 1000'

VERTICAL GRAPHIC SCALE

0' 50' 100'

NOTES:

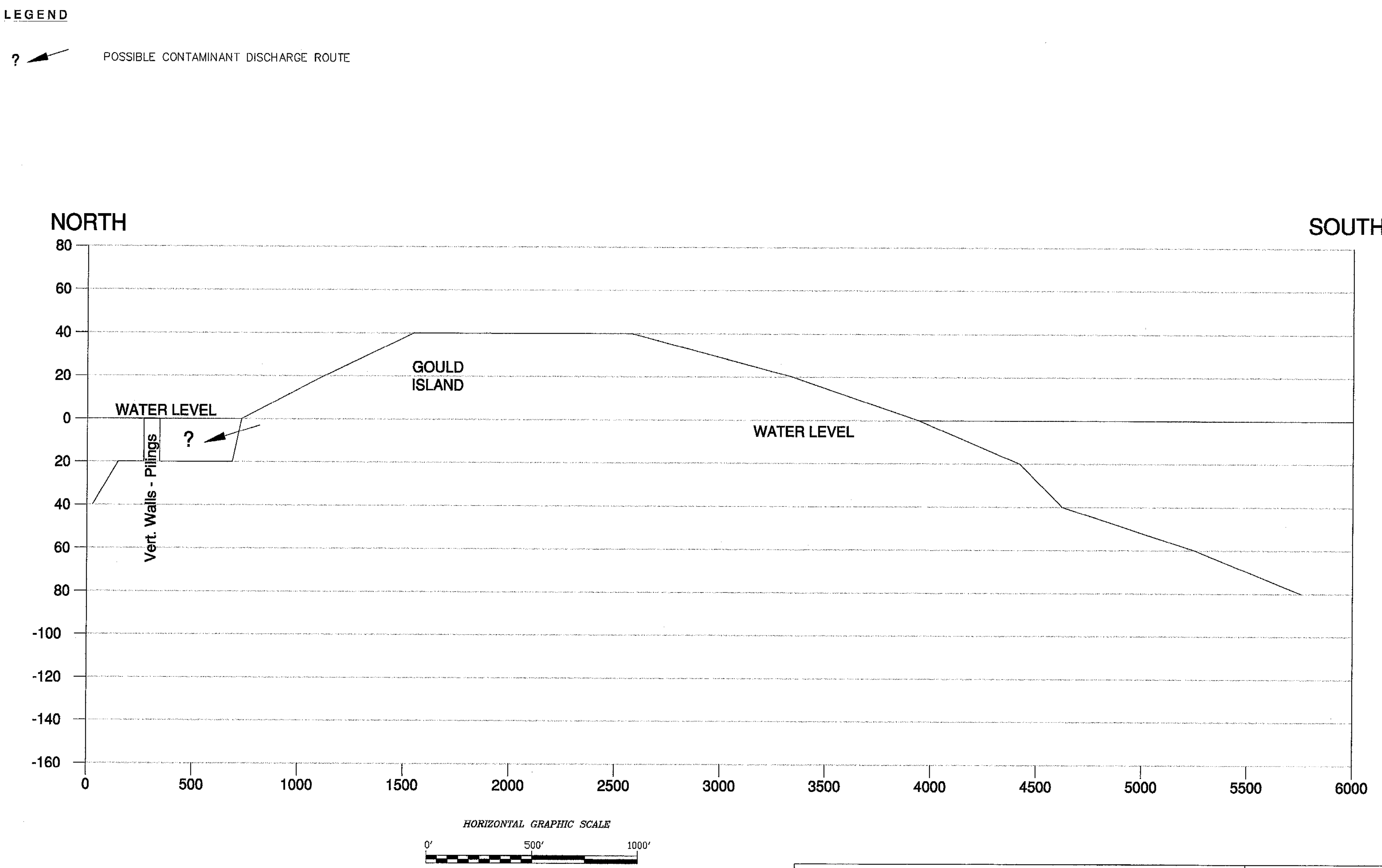
1. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. BOTTOM CONTOUR DATA INTERPRETED FROM NOAA CHART 13221, APRIL 15, 1995.

WEST–EAST CROSS SECTION			
SITE 17, GOULD ISLAND			
NAVSTA NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	L. SEYDEWITZ	DATE:	JANUARY 23, 2003
SCALE:	AS NOTED	FILE NO.:	DWG\5152\0430\FIG_2-6.DWG

FIGURE 2–5

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658–7899



NOTES:

1. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. BOTTOM CONTOUR DATA INTERPRETED FROM NOAA CHART 13221, APRIL 15, 1995.

NORTH–SOUTH CROSS SECTION			
SITE 17, GOULD ISLAND			
NAVSTA NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	L. SEYDEWITZ	DATE:	JANUARY 23, 2003
SCALE:	AS NOTED	FILE NO.:	DWG\5152\0430\FIG_2-6.DWG

FIGURE 2–6

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

PCBs remaining in soils or sediments at discharge locations:

PCBs are hydrophobic, tending not to dissolve in water or bind with water molecules, and they are lipophilic, meaning they are attracted to fats and oils. PCBs are also chemically stable, resisting decomposition. Therefore, the PCB molecules tend to adhere to soil or sediment particles, and if given liberty to travel in this form, they will become stored in the sediments of waterways. If they are ingested, they will tend to gather in the fat tissue of animals.

PCBs released to the ground at the former transformer buildings will likely have traveled as far as the free oil from those transformers has traveled, but once that extent was reached, the PCB molecules will likely have remained in the soils, or traveled overland or through storm drains to discharge areas along the shorelines. If they were taken up by organisms grazing or filterfeeding in the discharge areas, those PCBs might have entered the food chain. Some may also have been washed out with soil by wave action and these would persist with the soil particles, becoming bedded with any sediment depositional areas nearby.

Chlorinated VOCs seeping through soils into shallow bedrock fracture zones:

Chlorinated solvents such as trichlorethene (TCE) and tetrachloroethene are more dense than water and therefore tend to sink through the saturated soils and bedrock, seeking a path of least resistance until they reach a confining layer, and pool together. Or, if they meet a less permeable barrier in the soil or bedrock, they will travel downslope along that barrier, and continue to seek a downward gradient until they reach a groundwater discharge area (at this Site, one which is likely to be underwater). They are then released to the surface water body and dissipate through dilution. Natural degradation of TCE provides breakdown products such as dichloroetine (DCE) and vinyl chloride through the loss of the chlorine atoms. Based on the presumption that TCE was likely to have been released at this Site during the active operations period, these degradation products should be sought at the Site as well. VOCs are generally not bioaccumulated.

Oil and fuel related contaminants remaining in the shallow groundwater and soils, possibly discharging to the adjacent surface water:

Oil discharged to the surface water via overland turnoff or through channeled outfalls will behave not unlike any other fuel oil spill in the ocean. During ocean spills, oils are dispersed and degraded through a number of processes that include evaporation from floating slicks or sheens, dissolution and dilution, photochemical oxidation, and then sedimentation of the heavier fractions or emulsions. Once oil compounds have undergone the initial decomposition processes, and sedimentation occurs, microbial activity may begin degradation of the remaining components. However, due to low temperatures, lack of light, and the nature of the heavier molecules of PAH compounds, remnants of the oils in the form of PAH compounds are likely to remain in the sediments for a considerable amount of time. Most of these heavier hydrocarbons are hydrophobic and will move and behave in a manner similar to PCBs and silts in the marine environment, becoming more concentrated in depositional areas, or bound within bedded sediments that are not subject to wave action.

Direct (historic) discharge of solvents and plating solutions to the Bay, east of the Site:
Releases of plating wastes to the ocean is presumed to have occurred via drain pipes from Building 32. In addition, some discharge to the subsurface may have also occurred through disruptions in the drain pipes. Such discharges may have provided a contaminant load to the ground, and as groundwater passed through the contaminants, they could have been dissolved and transported with groundwater, providing a continuing source for low-level releases discharging to the marine environment, hydraulically downgradient of the electroplating discharge line.

Some metals leaching out of soils and possibly discharging to the adjacent surface water:
Electroplating operations usually involve use of acids and cyanide compounds, including sodium cyanide. These cyanide compounds released to the environment are highly soluble and are broken down by oxidation. However, if they are not exposed to air or water, they could remain in place in soils. This is a common problem in mine tailings, which leach cyanide with groundwater flow. Cyanide solutions discharged directly to the marine environment should mostly dissolve, leaving a residue of the other metals with which they were combined, including copper, chrome, silver and gold. Signs in the electroplating shop prior to demolition indicated use of chromic acid, sulfuric acid, nitric acid, muriatic acid, and caustic soda.

Appendix A also notes the findings of cyanide and copper in sediment and copper in mussels at the electroplating shop outfall at concentrations greater than reference stations in Portsmouth. It is important to note that these samples were taken in 1983, and that residual electroplating materials remained in the vats and containers at Building 32 until 1992, when waste removal actions took place. The presence of the residual waste in Building 32 in 1983 may have provided a contaminant load to the sediment and mussels that were sampled in 1983, however, the probable absence of this contaminant load since the 1992 removal may currently result in lower or undetectable levels of cyanide contamination.

Discharges of the plating wastes to the ocean may have resulted in the presence of cyanide, copper, chromium and other heavy metals in the sediments, and possibly in biota living within the sediments. Since the discharges were likely discontinued a number of years ago, some of the direct evidence of these discharges may have dissipated through dilution, sediment movement, and wave action.

2.5 PROBLEM DEFINITION AND DATA USE EVALUATION

The data quality objectives (DQOs) for this project were developed in accordance with the EPA Guidance for Data Quality Objectives (EPA G4 document). The G4 document suggests seven steps be followed to develop project DQOs. This action has been done in a cursory manner for this project, since the objectives for this investigation are in part also dictated by CERCLA guidance, the Federal Facilities Agreement, and other standard guidances to perform investigations. The intended use of the data resulting from a field investigation is a determining factor in defining the DQO for that data. To be certain that the data is consistent with the goals of the investigation, the seven steps of defining DQOs have been presented in this section.

The seven steps are described in the following subsections.

2.5.1 Statement of the Problem

Building 32 was constructed in the 1940s to service and store torpedoes used during World War II. All the facilities in the area were constructed to allow wastewater to discharge to Narragansett Bay, near the Gould Island shore.

Site history and design drawings for Building 32 show floor drains in the electroplating shop connecting to an acid resistant drain line that was designed to discharge into Narragansett Bay at the east shore of Gould Island. Floor drains and trench drains in the main portion of Building 32 also discharged to the bay through a series of sewerage/soil pipelines. It is assumed that most of the waste liquids were disposed of in this manner. Sludges are also typically generated during the electroplating process, and the disposal method for these materials is unknown. Site history indicates that this material may have been disposed of at an on-site landfill, which is not a part of this investigation.

The problem this investigation will address is whether use, storage or disposal of chemicals and chemical waste material from Building 32 activities have resulted in residual contamination to the soil and groundwater proximal to the building, and whether that contamination poses a viable risk to potential receptors at the Site. This investigation will focus on waste materials that were typically used in electroplating operations, on waste materials that have been found at other electroplating and degreasing operations sites, and on contaminants that have been detected during previous investigations at the Site. These will include metals, volatile organic compounds, semivolatile organic compounds and PCBs.

2.5.2 Identification of the Decision

Under this study, two decision points will be met. For human receptors, are exposure pathways complete, and if so, what is the risk to human receptors? For ecological receptors, are exposure pathways complete, and if so what are the risks to ecological receptors? If a reasonable potential for risks to receptors is present, the feasibility study will evaluate remedial actions to address those risks.

2.5.3 Inputs to the Decision

Inputs to the decision are the elements used in the decision process. Inputs to the decision as stated in Section 2.5.2 are as follows:

- Concentrations of the contaminants present - information to be derived from data already collected, and additional data to be collected as a part of this RI,

- Presence of receptors – based on records review conducted as described in this document, Site observations, and additional reviews to be conducted as part of the preparation of the RI,

- Presence of one or more completed exposure pathways to the receptors – based on contaminants found in the media at the Site, and fate and transport information developed through data collection and available documentation,

- EPA and RIDEM standards for determining adverse risk – based on published guidance documents, discussed in Section 5 of this Work Plan,

- Potential for contaminants to complete one or more exposure pathways in the future – based on possible contaminant transport through various media found at the Site, and

- Future use of the Site – based on current use of adjacent properties (recreational to the south, military/industrial to the north).

2.5.4 Definition of the Study Boundaries

Study boundaries can be physical and temporal. This section defines the boundaries and the rationale for their selection.

Two separate areas require evaluation. The first is the onshore area, defined as the terrestrial environment outward to mean low water. The second is the marine environment, which includes the offshore area, extending inward to the mean high water. The intertidal area does overlap as necessary to fully evaluate both areas and both sets of receptors.

The statement of the problem and decision points stated in Sections 2.5.1 and 2.5.2 focus on the waste generated from the electroplating shop and degreasing operations at Building 32. Because other source areas may exist on the island, this RI will have to remain focused on the area proximal to Building 32 and the discharge pipes exiting the building to avoid interference from other potential source areas. Therefore, the study will evaluate the soil and groundwater under the building, the discharge pipes, the fenced area to the west and south of the building, and the island landmass to the north and east of the building.

Contaminant discharges to ocean water under different tide and wind conditions could have resulted in contaminant deposition anywhere near the discharge pipes outfalls. The most recent analysis of sediment samples from the area indicates the presence of moderate concentrations of metals in the sediment at and near the electroplating shop discharge pipe. At the time of that sample collection (1986), large quantities of what were believed to be plating residues remained in the vats and trenches connected to the discharge pipe, which may have constituted a continuing source (ENSR, 1992). Since that sample collection effort, the waste residues have been removed, eliminating that source. It is expected that the material in the onshore portions of the Site (in the soil and possibly under the building) are likely to have degraded very little. However, migration and degradation of contaminants over time in the marine systems may have resulted in the dispersion of contaminants in these offshore areas.

Because the RI is intended to determine the nature and extent of contamination, this study will address the onshore area in detail, and provide for a first view of sediment investigations based on where contaminants were discharged, and where they might have been deposited, based on prevailing winds, currents, and other influences.

Temporal boundaries are more difficult to isolate. While the site history reveals that activity was limited to a period 40 to 50 years in the past, residual discharges may have occurred as recently as 1990, prior to removal activities. Regardless, the current exposure and current and future risk must be evaluated. Current risk will be based on current use of the Site (an industrial property subject to occasional trespass) and on concentrations of contaminants detected. Future risk will be determined based on future use of the Site and reasonable maximum concentrations of contaminants that may be present in the future. Because the contaminant sources have been removed, it is reasonable to believe that the current concentrations detected at the Site will be the same or higher than the reasonable maximum concentrations that will be present in the future, owing to continued degradation, dispersion, and/or retention and perseverance. Since the Navy has no definite plans for the Site, assumptions of future use of its onshore locations will be made.

2.5.5 Decision Rule

The decision rule is a clear statement defining the requirements of the investigation based on the possible outcomes of the study. For this RI, the nature and extent of contamination shall be delineated, for the following purposes:

1. To determine if the human health risk assessment provides an estimated, quantified non-cancer risk providing a HQ of 1.0 or greater, and/or an increased incremental cancer risk in the range of 1E-6 to 1E-4. If so, that risk will be used to consider actionable contaminant concentrations in the risk management process associated with the FS and decision documents.

2. To determine if the ecological risk assessment provides a high potential for adverse effects (measured dose and associated response from site-related contaminants) to ecological receptors. If so, that risk will be considered actionable for consideration in the risk management process associated with the FS and decision documents. Dose is defined as the concentration of the contaminant to which the receptors are exposed, and response is defined as a toxic effect such as impaired reproduction or inhibited growth.

Additional details on the risk assessment efforts are provided in Section 5 of this Work Plan.

2.5.6 Limits on Decision Errors

The limits of decision errors are set to quantify the potential for false negative and false positive decisions. A RI study is inherently designed to result in a low potential for a false negative decision, i.e., a decision that the estimated risk is low, when it is in actuality higher. Conversely, a somewhat higher tolerance for a false positive decision (estimating risk higher than it actually is) is acceptable for the RI, since the resulting effect is a conservative evaluation of risk reviewed during the risk management process. A new decision rule would be set for a cleanup action as a part of the Record of Decision (ROD).

Therefore, a number of sample stations are required, all targeted toward likely release points. A conservative assessment of risks will decrease the potential for a false negative decision but not overly increase potential for a false positive decision. A larger data set will reduce both the false positive decisions and the false negative decisions. Additional conservatism is applied with exposure scenarios and other parameters used to measure exposure. In addition, the reasonable worst-case scenario for exposure will be evaluated using the maximum concentrations detected. Average concentrations are also used in the risk assessments to provide a means of comparison.

2.5.7 Design for Obtaining Data

The DQO process described in the G4 DQO document describes the use of various statistical approaches for developing a database. These approaches are based on the representativeness of the data that is required. For instance, if the Decision Rule was to "remove soils with concentrations of lead above 10 mg/kg" the sampling plan would be based on identifying hot spots of a specific size, which is determined by the precision of the removal action to be taken.

However, since this investigation is being performed to measure reasonable maximum risk to receptors, the design of the sampling plan can be more qualitative, or "targeted". The sampling plan is provided in Section 3 of this Work Plan, and calls for the collection of samples in two distinct areas, the onshore area and the offshore area. Samples from both areas will be collected to measure concentrations of contaminants present to which human and ecological receptors may be exposed.

Specifics on the precision, accuracy, etc. of the data collected are described in the Quality Assurance Project Plan, presented in Section 4 of this Work Plan.

3.0 SAMPLING AND ANALYSIS PLAN

This section presents a description of the data collection activities planned for this investigation. This includes a rationale for field investigation design, description of field investigation efforts, sampling and data acquisition procedures and requirements, and the analytical plan for the samples to be collected.

3.1 INTRODUCTION

The Sampling and Analysis Plan has been prepared to direct the collection of data that will provide a foundation for the RI report. The data will be used to describe the nature and extent of contamination at the Site, provide exposure point concentrations for the human health risk assessment, and provide exposure data for the first tier of an ecological risk assessment.

In order to effectively design a sampling program for the Site, the conceptual model provided in Section 2.4 has to be considered. The conceptual site model outlines the environmental factors at the Site that are documented to date, but speculates somewhat on the factors that are likely to exist, but are as yet unconfirmed. The sampling program presented in this section has been designed to build on the information documented to date by collection of complimentary data that will be used to complete the conceptual model with reasonable certainty.

The field sampling program is also designed so that, to the extent possible, data collected can be used to direct or refine planned samples and well installations, and to direct any necessary future sampling and investigative efforts not described in this Work Plan. This flexible approach uses field screening techniques wherever possible, and includes critical decision points, rather than a rigid task listing that must be carried out regardless of the information developed in the process.

To use the flexible approach, and to involve the stakeholders at the critical decision points in the most efficient way possible, the investigation is planned in two major phases, each with several short investigative efforts, or tasks, with time for data analysis and evaluation between them.

<u>Phase 1 Goals</u>

Phase 1 activities will be conducted to clarify the understanding of the conditions at the Site which are currently unknown, and to assure that the nature of the contaminants present is known. Phase 1 goals are summarized below:

- Determine depth to bedrock and condition of subsurface materials at the Site that may affect contaminant leaching and transport.

- Determine if there are likely to be continued contaminant discharges from the subsurface materials to the surface waters adjacent to the Site.
- Determine groundwater flow directions at the Site and estimate horizontal and vertical gradients to estimate discharge from the overburden and bedrock aquifers to the Bay.
- Determine if there is residual sediment contaminant presence in nearby depositional areas that can be associated with historic or continuing contaminant discharges from the Site.
- Determine purpose and role of underground structures that are not provided on historic drawings and records, and identify any possible underground injection points.
- Determine presence of receptors that may interact with Site contaminants.

Phase 2 Goals

Phase 2 activities will be conducted to refine the understanding of the extent of contamination present at the Site, and to determine effects of contaminants on ecological receptors present. The Phase 1 determinations will be used to direct additional data collection to meet the Phase 2 goals, summarized below:

- Determine extent of groundwater contaminant plume(s) and distribution of contaminants through additional sampling to be directed by likely flow directions of sediment and groundwater.
- Determine possible toxic effects of contaminants on ecological receptors present, based on contaminants found at locations where receptors can be exposed.

3.2 PHASE 1 ACTIVITIES

Four efforts will be conducted to achieve the Phase 1 goals. A geologic and hydrogeologic investigation will be conducted, a sediment survey and depositional area sampling will be conducted, and a review and investigation of unknown structures and UICs will be conducted. Finally, an ecological evaluation of the area will be conducted (terrestrial, intertidal, and subtidal) to identify receptors in the area.

3.2.1 Geologic and Hydrogeologic Investigation

A geologic and hydrogeologic investigation will be conducted to determine the behavior of contaminants in the subsurface materials, and to determine the nature and extent of the contaminants in the subsurface soils and groundwater, as described above. The goals for the geologic and hydrogeologic investigations will be met through the application of standard field investigations and evaluations modified for use at this Site. TtNUS standard operating procedures (SOPs) for geologic and hydrogeologic investigations have been evaluated for use at this Site, and those that are anticipated for use are identified below, and provided in Appendix C of this Work Plan.

GH-1.3	Soil Sampling
GH-1.3	Soil and Rock Drilling
GH-1.5	Borehole and Sample Logging
GH-2.8	Groundwater Monitoring Well Point Installation
SA-1.1	Groundwater Sample Acquisition and Onsite Water Quality Testing

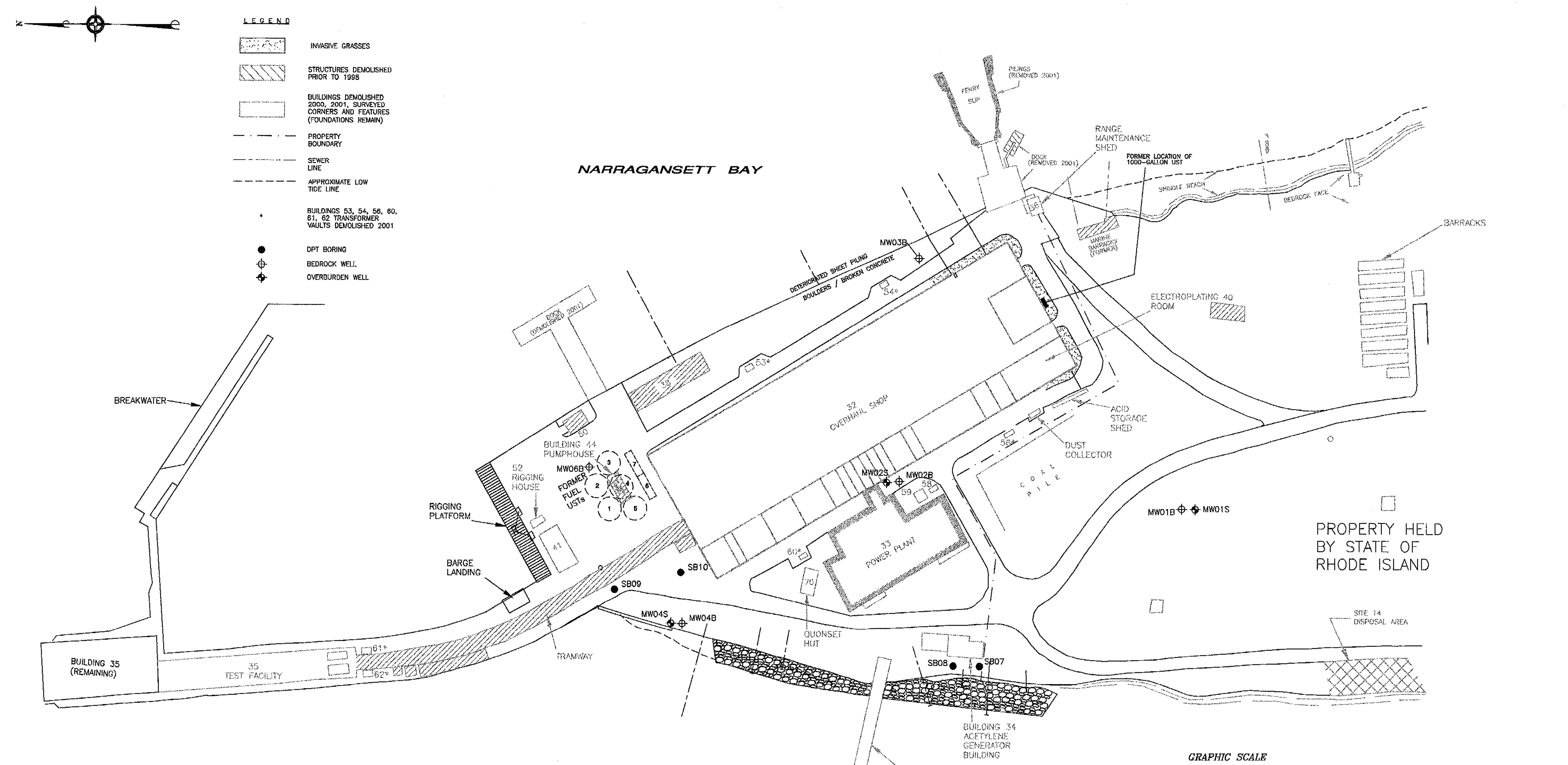
These SOPs have been reviewed for work at the Site, and summarized below. These summaries are provided for the field crew and oversight parties for reference on procedural applications. Any modifications to the SOPs that are appropriate for the site-specific tasks are described in the sections that follow.

3.1.1.1 General Approach for Boring and Well Installations

This section and the subsections that follow discuss the geological and hydrogeological investigation activities that will be conducted during Phase I field activities, including the advancement of borings for soil sample collection and/or monitoring well construction. A drilling subcontractor, supervised by a TtNUS field geologist, will use drive and wash drilling methods to advance ten borings, six of which will include soil sample collection. Using direct push technique (DPT), the subcontractor will also advance 22 DPT borings for soil sample collection. Some of these DPT borings may be finished as small diameter water table monitoring points, pending evaluation of associated soils. Soil samples from all borings will be collected for evaluation of soil conditions, VOC headspace screening, and possible laboratory analysis. The collection and analysis of these soil samples is to provide data to evaluate the presence of potential contaminants related to Building 32.

Figure 3-1 presents the approximate locations of borings and monitoring wells that are proposed to be installed outside the Building 32 foundation. Figure 3-2 presents the anticipated locations of DPT borings that would be installed through the existing Building 32 foundation. Table 3-1A presents the rationale for these installations.

Detailed descriptions of the materials encountered and sampled in these borings will be recorded on the boring logs. An example of a boring log is provided in Appendix D. The soils will be described using the Unified Soil Classification System (USCS) as detailed in TtNUS SOP GH-1.5 Section 5.2 (S2).



REFERENCE PLANS:

1. US NAVY EXISTING CONDITIONS MAP, US NAVAL TORPEDO STATION, NEWPORT, RHODE ISLAND, 6/30/47

2. DRAINS, TRENCHES, ETC. GOULD ISLAND BUILDING 32 SITE, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC. CTO 286, LFA#970706, 4/25/00

3. GEOTECHNICAL SURVEY PLAN AT FORMER BUILDING 44 AND 32, US NAVAL BASE ON GOULD ISLAND, LOUIS FEDERICI & ASSOCIATES FOR BROWN & ROOT ENVIRONMENTAL, 9/8/97, DWG#970706-03

4. LOCATION OF MONITORING WELLS AT BUILDING 32 - GOULD ISLAND, U. S. NAVAL BASE NEWPORT, RHODE ISLAND, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC., 5/9/00

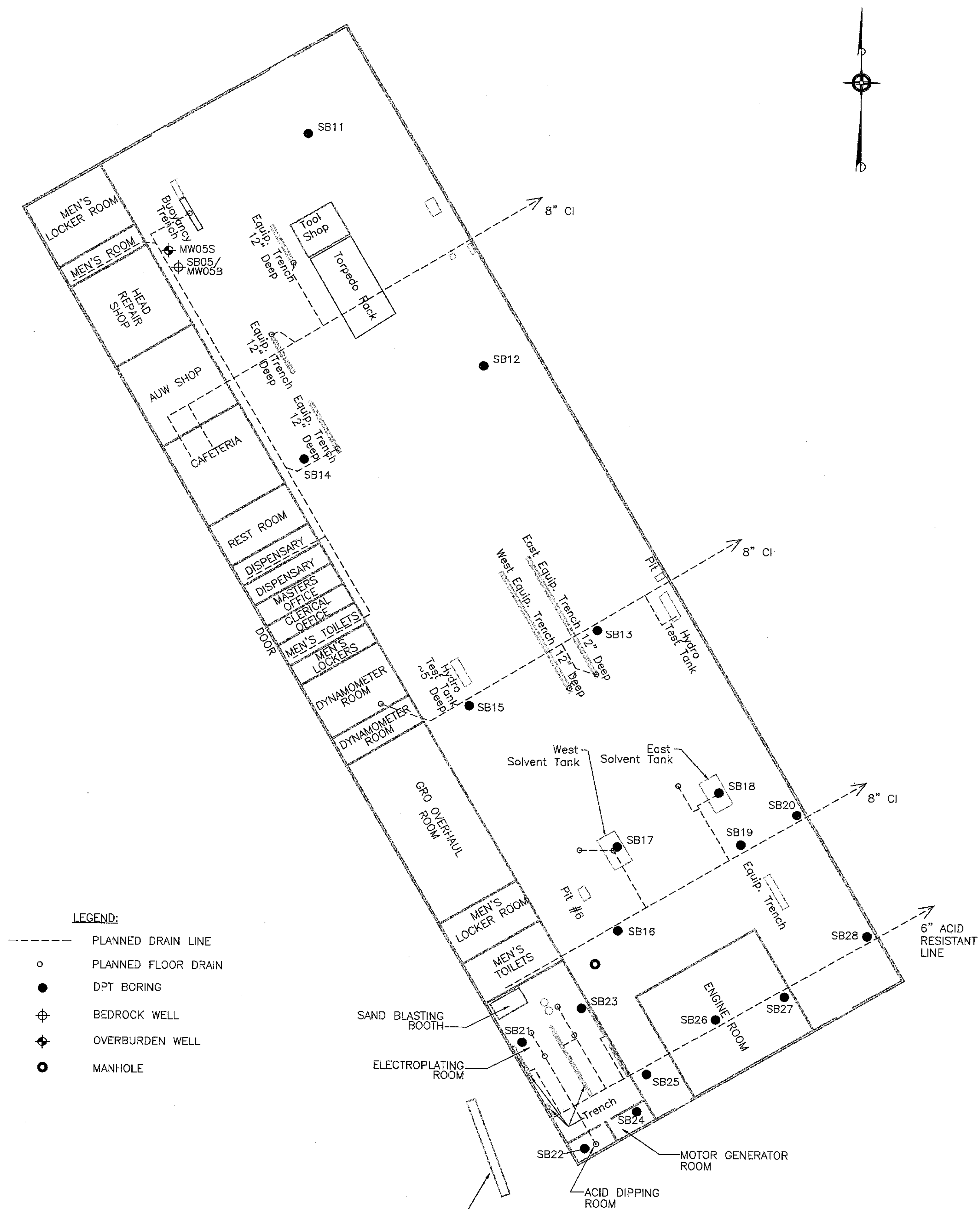
NOTES:

1. PLAN NOT TO BE USED FOR DESIGN.

2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.

3. PHYSICAL FEATURES SHOWN MAY NOT DEPICT CURRENT CONDITIONS

HISTORICAL FEATURES AND PROPOSED BORINGS/MONITORING WELLS				FIGURE 3-1
SITE 17, GOULD ISLAND				TETRA TECH NUS, INC.
NAVSTA NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	L. SEYDEWITZ	DATE:	JANUARY 23, 2003	
SCALE:	AS SHOWN	FILE NO.:	DWG\5152\0430\FIG_3-1.DWG	



NOTES:

1. NOT FOR DESIGN
2. ALL LOCATIONS ARE APPROXIMATE
3. VERTICAL DATUM IS BASED ON THE NAVY BM H-2, LOCATED AT THE NORTHEAST NUT ON VALVE HYDRANT OPPOSITE SOUTHWEST CORNER OF BUILDING #32, ESTABLISHED BY P.W. SURVEY PARTY, DATED 1/3/45, BOOK NUMBER 20-B PAGE 10, MLW ELEVATION (LOCAL) 14.12.
4. HORIZONTAL DATUM IS BASED ON THE NORTH AMERICAN DATUM, R.I. STATE PLANE 1983.
5. U.S. NAVAL OPERATING BASE, NEWPORT, R.I. TORPEDO STATION GOULD ISLAND OVERHAUL SHOP PLUMBING FLOOR PLAN, CONT. NO. 4994, DRAWING P-201, DATED MARCH 14, 1942, BY JOHN BRACKETT, CONSULTING ENGINEER.

GRAPHIC SCALE

0' 60' 120'

BUILDING 32 LAYOUT, DRAINAGE, AND PROPOSED BORINGS AND MONITORING WELLS			FIGURE 3-2
SITE 17, GOULD ISLAND			TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND			
DRAWN BY: D.W. MACDOUGALL	REV.: 0		
CHECKED BY: L. SEYDEWITZ	DATE: JANUARY 23, 2003		55 Jonspin Road Wilmington, MA 01887
SCALE: AS SHOWN	FILE NO.: DWG\5152\0430\FIG_3-2.DWG		(978)658-7899

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TABLE 3-1A
PROPOSED SOIL BORING LOCATIONS AND PURPOSE
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

LOCATION	NUMBER/TYPE OF BORINGS	BORING IDENTIFICATION	PURPOSE OF BORING
On hill/berm southwest of electroplating shop	1 Soil Boring	B01	Identification of contaminants and characterization of soils for geologic conditions at an upgradient area. Complete as overburden and bedrock wells.
Between Former Building 32 and 33	1 Soil Boring	B02	Identification of contaminants and characterization of soils for geologic conditions. Complete as overburden and bedrock wells
West of Former Building 34	2 DPT Borings	SB07/SB08	Identification of contaminants in soil associated with local activities.
West of Former Building 44 and tramway	2 DPT Borings	SB09/SB10	Characterization of soils and identification of contaminants associated with local activities - former location of TCE detected in soil gas and possible former storage area. Complete B04 as overburden and bedrock wells.
	1 Soil Boring	B04	
Area around Former Building 44	1 Soil Boring	B06	Identification of contaminants downgradient of Site and characterization of soils for geologic conditions. Complete as bedrock well.
Beneath Former Building 32	5 DPT Borings	SB11/SB12/SB13/SB14/SB15	Identification of contaminants and characterization of soils under Building 32, former location of maximum TCE and PAHs detected in soil gas. Complete B05 as overburden and bedrock wells.
	1 Soil Boring	B05	
Near former solvent tank and discharge pipe	5 DPT Borings	SB16/SB17/SB18/SB19/SB20	Identification of contaminants and characterization of geologic conditions - DPT borings at former location of solvent and sewer discharge route, B03 at former location of PCBs detected in soil. Complete B03 as bedrock well.
	1 Soil Boring	B03	
Near electroplating shop and discharge drain	8 DPT Borings	SB21/SB22/SB23/SB24/SB25/SB26/SB27/SB28	Identification of contaminants - former location of TCE and PAHs detected in soil gas, and possible leakage from floor drains and from discharge pipe of electroplating wastes.

TABLE 3-1B
PROPOSED WELL INSTALLATIONS AND PURPOSE
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

BORING/WELL NUMBER	LOCATION	WELL SCREEN INTERVAL*	PURPOSE OF INSTALLATIONS
MW01S/MW01B	Upgradient Location - Located on hill/berm southwest of electroplating shop in densely vegetated area (Refer to Figure 3-1)	To be determined - MW01S to be screened in overburden at top of water table. MW01B to be screened in bedrock (approximately 10-30 feet below top of rock)	Establish reference groundwater quality in overburden and shallow bedrock, and assist determination of groundwater flow dynamics
MW02S/MW02B	Between Building 32 and 33, in area of potential impacts from former coal pile and leaks or releases from floor drains, cracked floor slab, etc.	To be determined by headspace screening results of soil samples collected: MW02S to be screened in overburden at any zone of contamination. MW02B to be screened in bedrock (approximately 10-30 feet below top of rock)	Assess impacts of former coal pile and surrounding building's activities to downgradient groundwater quality in overburden and bedrock, and assist determination of groundwater flow dynamics
MW03B	East of Building 32, in area of potential impacts from leaks or releases from former solvent tank discharge pipe, floor drains, etc. and coupled with existing shallow well, MW03S	Anticipated to be screened in bedrock (approximately 10-30 feet below top of rock)	Assess impacts of shop and discharge pipe to downgradient groundwater quality in overburden and bedrock and to assist determination of groundwater flow dynamics.
MW04S/MW04B	West of Building 44 and former tramway, in area where TCE was previously found in soil gas samples (refer to Appendix A)	To be determined by headspace screening results of soil samples collected: MW04S to be screened in overburden at any zone of contamination. MW04B to be screened in bedrock (approximately 10-30 feet below top of rock)	Assess impacts of shop and former storage area groundwater quality in overburden and bedrock, and to assist determination of groundwater flow dynamics

TABLE 3-1B (cont.)
PROPOSED WELL INSTALLATIONS AND PURPOSE
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 2

BORING/WELL NUMBER	LOCATION	WELL SCREEN INTERVAL*	PURPOSE OF INSTALLATIONS
MW05S/MW05B	Located on the northwest corner of Building 32	To be determined - MW05S to be screened in overburden at top of water table. MW05B to be screened in bedrock (approximately 10-30 feet below top of rock)	Assess impacts of shop to groundwater quality in overburden and bedrock, and to assist determination of groundwater flow dynamics
MW06B	Located in the area of Building 44, in area of potential impacts from leaks or releases from former USTs and will be coupled with existing shallow well MW-001R.	Anticipated to be screened in bedrock (approximately 10-30 feet below top of rock)	Assess impacts of shop and former fuel USTs to downgradient groundwater quality in overburden and bedrock and to assist determination of groundwater flow dynamics

* - Note: Well screen intervals in overburden will be determined based on conditions encountered during drilling. Additional wells may be installed at any location where multiple zones of contaminants and /or confining layers are detected in the overburden.

TABLE 3-1C
PROPOSED SEDIMENT SAMPLE LOCATIONS AND PURPOSE
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE NUMBER	LOCATION	PURPOSE OF SAMPLE
SD01	At south end of Gould Island, in area of softer sand, presumably a depositional area for sediment transported down-bay	Assess the downgradient depositional marine sediment
SD02	South of Site 17 on east shoreline of Gould Island, this area is believed to be down-stream of the presumed release points	Assess the downgradient depositional marine sediment
SD03	At storm drain discharge, immediately south of other drain discharge points	Assess the local sediment conditions at the discharge point
SD04	At electroplating room drain discharge	Assess the local sediment conditions at the discharge point
SD05	At sewer discharge shared by solvent tanks and degreasers	Assess the local sediment conditions at the discharge point
SD06 and SD07	At sewer and storm drain discharge points	Assess the local sediment conditions at the discharge points
SD08	At north end of Gould Island, under or near the rigging platform and within the boat basin, presumed to be a depositional area, but also affected by erosion of soil from the soils near former buildings 41, 44, and the rigging house	Assess the local sediment conditions at the erosion area
SD09 and SD10	At sewer and storm drain discharge points on west shoreline	Assess the local sediment conditions at the discharge points
SD11	Southwest of Site 17 in an area presumed to be less affected by depositional sediment originating from the Site	A reference sample not within the depostional marine sediment area and not potentially impacted from the Site

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Six soil borings (B01 through B06, Table 3-1A) will be advanced using drive and wash methods to determine the nature of the underlying natural soils, to determine the depth of the water table, and to determine if non-aqueous phase liquids (NAPL) are present. These six borings will be continued to top of rock and then continued into bedrock using NX coring techniques. Soil samples will be collected throughout the overburden at 2-foot intervals for visual evaluation of soil conditions, for contaminant screening, and for possible laboratory analysis of VOCs, SVOCs, pesticides/PCBs and inorganics (including cyanide). All drive and wash borings will likely be completed as bedrock monitoring wells, as described in Tables 3-1A and 3-1B.

Drilling fluids will consist of potable water or sea water taken directly from Narragansett Bay. The use of drilling mud consisting of pure bentonite and water requires prior Project Manager approval and should only be used if technical problems arise from the use of water free of additives. No synthetic additives may be used in the mud, if approved for use. Rock cores will similarly be advanced with potable or sea water only. The drilling water source will be pre-approved by TtNUS, and sampled as "field blank" (Section 4). Random tanks of water transported to the drill sites will be screened for VOCs according to TtNUS procedures described in SOP SF-1.5. Drilling fluids and wash-tub contents will be removed and replaced with clean water prior to bedrock coring.

Twenty-two shallow borings (SB07 – SB28, Table 3-1A) will be advanced using DPT on the Site to determine the nature of the underlying natural soils, to determine the depth of the water table, and to determine the presence of NAPL. Samples will be collected at 2-foot intervals for evaluation of soil conditions, for jar headspace screening analysis and for possible analysis of VOCs, SVOCs, pesticides/PCBs and inorganics (including cyanide).

Four additional borings will be advanced for the sole purposes of installing shallow overburden water table wells, co-located with bedrock monitoring wells (installed as described above). No soil samples will be collected from these co-located borings unless samples could not be collected from the initial borings at these locations and depths.

Soil samples at each boring location will be collected using the procedures described in the following sections. These procedures have been prepared for this project in accordance with the following applicable sections of TtNUS SOP SA-1.3 provided in Appendix C; Sections 5.6 (Subsurface Soil Sampling with a Split-Barrel Sampler) (S4); Section 5.2.1 (Procedure for Collecting Soil Samples for Volatile Organic Compounds) modified as described below; and Section 5.2.2 (Procedure for Collecting Non-Volatile Soil Samples).

3.2.1.2 Subsurface Soil Sample Acquisition

At each of the 28 boring locations where soil sampling will be conducted, laboratory analytical samples will be collected continuously at 2-foot intervals through natural soils, to the depth of the water table, as defined by the field geologist. These samples for laboratory analysis will be collected beginning from the ground surface, or from the top of the soils under pavement or concrete surfaces, if present. Sample depths will be measured from the ground surface at two-foot increments. Samples for possible laboratory analysis will be collected to top of bedrock, or to the top of the water table, whichever is encountered first. Each soil sample collected for laboratory analysis will be analyzed for VOCs, SVOCs, TPH-diesel range organics (DRO), pesticides/PCBs, and metals, including cyanide. A summary of samples to be collected is provided on Table 3-2.

A drilling subcontractor under the supervision of a senior TtNUS geologist will collect all of the subsurface soil samples, as described in Section 5.1 of TtNUS SOP SA-1.3. A modified Standard Penetration Test (SPT) based on ASTM D-1586-84 will be used to collect the split-barrel samples. The modification to the standard procedure is the use of nominal 3-inch inside diameter (ID) split-barrels in place of 2-inch ID split-barrels to collect additional volume for analytical samples. In order for the SPT blow counts to be comparable to standard 2-inch SPT blow counts, the use of a 300 lb. hammer with an 18-inch fall shall be used in place of a 140 lb. hammer with a 30-inch fall. This modification is based on an Army Corps of Engineers New England District geotechnical drilling standard of practice.

<u>Samples Collected for Laboratory Analysis:</u>
Two sample aliquots will be collected from each 2-foot long split barrel interval, if sufficient soils are recovered. Required sample containers are described on Table 3-3. One aliquot will be used for jar headspace screening analysis, and the second aliquot will be stored for possible laboratory analysis. If insufficient sample volume is recovered for two separate samples, the entire 2-foot interval will be collected as one sample. If there is insufficient sample volume to collect all of the analytical parameters due to poor sample recovery, the following priority will be used when filling the appropriate bottleware:

1. VOCs & percent moisture (minimum volume for percent moisture is 1/2 of the 2 oz. container).
2. Inorganics, including cyanide (minimum volume required is 3/4 of the 4 oz. container).
3. SVOCs/Pesticide/PCBs (minimum volume required is 3/4 of the 8 oz. container).
4. Total Petroleum Hydrocarbons in the diesel range (DRO) (minimum volume required is 3/4 of the 8 oz. container).

TABLE 3-2
FIELD QUALITY CONTROL SAMPLE SUMMARY
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Media	Analysis	Field Samples	Field Duplicates	Rinsate Blanks	Field Blanks	Trip Blanks	Total Quantity
Sediment	TCL VOCs	22	3	1	1	1	28
	TCL SVOCs	22	3	1	1	0	27
	TCL Pesticides/PCBs	22	3	1	1	0	27
	DRO	22	3	1	1	0	27
	TAL Metals	22	3	1	1	0	27
	Cyanide	22	3	1	1	0	27
	AVS/SEM	22	3	0	0	0	25
	TOC	22	3	0	0	0	25
	Grain Size	22	3	0	0	0	25
Soil	TCL VOCs	56	6	1	1	6	80
	TCL SVOCs	56	6	1	1	0	74
	DRO	56	6	1	1	0	74
	TCL Pesticides/PCBs	56	6	1	1	0	74
	TAL Metals	56	6	1	1	0	74
	Cyanide	56	6	1	1	0	74
Residue	TCL VOCs	10	1	1	1	2	15
	TCL SVOCs	10	1	1	1	0	13
	DRO	10	1	1	1	0	13
	TCL Pesticides/PCBs	10	1	1	1	0	13
	TAL Metals	10	1	1	1	0	13
	Cyanide	10	1	1	1	0	13
Groundwater	TCL VOCs	12	2	1	1	3	19
	TCL SVOCs	12	2	1	1	0	16
	TCL Pesticides/PCBs	12	2	1	1	0	16
	DRO	12	2	1	1	0	16
	TAL Metals	12	2	1	1	0	16
	Cyanide	12	2	1	1	0	16
	TOC	12	2	0	0	0	14
	Alkalinity	12	2	0	0	0	14
	Sulfides	12	2	0	0	0	14

TABLE 3-3
SAMPLE CONTAINER, PRESERVATIVE, AND HOLDING TIME REQUIREMENTS
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE MEDIUM	ANALYSIS (Method Reference)	SAMPLE CONTAINER	PRESERVATIVE	HOLDING TIME
Sediments	TCL VOCs (SOW OLM03.2) Percent Moisture (OLMO 3.2) TCL SVOCs (SOW OLM03.2) TCL PCBs/Pesticides (SOW OLM03.2) TPH DRO (EPA 8015A) TAL Metals (SOW ILM04.0) Cyanide (EPA 9010B) AVS/SEM (Allen & Fu) TOC (Loyd Kahn) Grain Size Distribution (ASTM D422-63)	2 oz VOA vial 8 oz wide mouth jar 8 oz wide mouth jar 8 oz wide mouth jar 4 oz wide mouth jar 4 oz wide mouth jar 8 oz wide mouth jar 2 oz wide mouth jar 16 oz wide mouth jar	Methanol, Cool to 4°C Cool to 4°C Cool to 4°C Cool to 4°C Cool to 4°C Cool to 4°C Cool to 4°C Cool to 4°C None	14 Days (Analysis) 7 Days (Extraction) 7 Days (Extraction) 28 Days Hg 28 Days, Others 6 months 7 Days 14 Days (Analysis-AVS) 28 days (Analysis - SEM) 28 Days (Analysis) None
Soils, Residue	TCL VOCs (SOW OLM03.2) Percent Moisture (OLMO 3.2) TCL SVOCs (SOW OLM03.2) TPH DRO (EPA 8015A) TCL PCBs/Pesticides (SOW OLM03.2) TAL Metals (SOW ILM04.0) Cyanide (EPA 9010B)	2 oz VOA vial 8 oz wide mouth jar 8 oz wide mouth jar 8 oz wide mouth jar 4 oz wide mouth jar 4 oz wide mouth jar	Methanol, Cool to 4°C Cool to 4°C Cool to 4°C Cool to 4°C Cool to 4°C Cool to 4°C	14 Days (Analysis) 7 Days (Extraction) 28 Days 7 Days (Extraction) Hg 28 Days, Others 6 months 7 Days

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TABLE 3-3 (cont.)
SAMPLE CONTAINER, PRESERVATIVE, AND HOLDING TIME REQUIREMENTS
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 2

SAMPLE MEDIUM	ANALYSIS (Method Reference)	SAMPLE CONTAINER	PRESERVATIVE	HOLDING TIME
Groundwater	TCL VOCs (SOW OLM03.2)	2 - 40 ml VOA vials	HCl to pH <2/Cool to 4°C	14 Days (Analysis)
	TCL SVOCs (SOW OLM03.2)	1 liter amber bottle	Cool to 4°C	7 Days (Extraction)
	TPH DRO (EPA 8015A)	1 liter amber bottle	Cool to 4°C	14 Days (Analysis)
	TCL PCBs/Pesticides (SOW OLM03.2)	1 liter amber bottle	Cool to 4°C	7 Days (Extraction)
	TAL Metals (SOW ILM04.0)	1 liter PE bottle	HNO_3 to pH <2	Hg 28 Days, Others, 6 months
	Cyanide (EPA 9010B)	500 ml PE bottle	Cool to 4°C, NaOH to pH>12	14 Days
	TOC (415.1 – carbon analyzer)	40 ml vial	Cool to 4°C, H_2SO_4 to pH<2	28 Days
	Alkalinity (310.1 - titration)	1 liter PE bottle	Cool to 4°C	14 Days
	Sulfides (376.1 - titration)	1 liter PE bottle	Cool to 4°C, Zinc Acetate and NaOH to pH>9	7 Days
	Specific Conductance (EPA	Field Measurement	Not Applicable	Not Applicable
	120.1)	Field Measurement	Not Applicable	Not Applicable
	pH (EPA 150.1)	Field Measurement	Not Applicable	Not Applicable
	Temperature (EPA 170.1)	Field Measurement	Not Applicable	Not Applicable
	Dissolved Oxygen (EPA 360.1)	Field Measurement	Not Applicable	Not Applicable
	Turbidity (EPA 180.1)	Field Measurement	Not Applicable	Not Applicable
	Salinity (Standard Methods)	Field Measurement	Not Applicable	Not Applicable

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Two samples will be collected from each boring for laboratory analysis. The first sample will be the 0-2' interval, and the second will be selected from the remaining boring samples taken, based on screening results, position of the water table, and visual, olfactory, or soil conditions noted.

With the exception of the VOC samples, the soil samples for all analyses will be collected as a homogenized composite of the target depth interval. The VOC sample will be collected as a grab sample from the most heavily contaminated portion of the split-barrel sampler, based on the initial screening results and/or visual observations. If no initial VOC screening readings are noted and no visual evidence of contamination is found, the grab VOC samples will be collected from the center of the target sample interval. Observed geologic conditions possibly affecting contaminant distribution, such as potential confining layers, coarse-grained (relatively high porosity/permeability) soils, or the vadose zone above the water table, will be taken into account when selecting the VOC sample location from the split-barrel sampler.

If free product or NAPL is identified within the split-barrel soil samples, the sample will be collected in a similar fashion as the soil described above. This NAPL sample will replace the soil sample from this depth interval and will be sent to the analytical laboratory with a note for a separate run, due to likely higher concentrations of contaminants.

<u>Soil Sampling Procedures for VOC Samples (Grab)</u>

Soil samples for VOC analysis will be collected in accordance with the following SOP references, amended as described in this section:

- TtNUS SOP GH 1.3 - Soil Sampling

- EPA-Draft 1.4 Draft Standard Operation Procedure for Soil Sample Collection and Handling for the Analysis of Volatile Organic Compounds (March 1997)

Each soil VOC sample is to be preserved with methanol immediately after collection, and partnered with an aliquot to be analyzed for percent moisture. The following procedure for VOC soil samples shall be followed:

1. Label a pre-tare weighted 40-ml amber VOC vial (containing 5 ml of purge and trap grade methanol) with the sample location number and depth.

2. Collect a grab core soil (about 5g) with a 10-ml pre-cut syringe. **If NAPL is noted within the soils then a reduced volume of approximately 1 - 2 g should be collected as a separate "medium concentration" (NAPL) sample**. Extrude the sample into the 40-ml VOC vial containing the methanol. The soil must be immersed in the methanol; recollect the sample using a smaller volume if necessary. Avoid touching the thread of the vial neck or spilling methanol. Cap the vial and invert it several times to mix the preservative with the sample.

3. Weigh the sample vial to the nearest 0.01 g and record the weight in the field log sheet. Pack and ship to the laboratory. Include the field log sheet containing the sample weight information with the samples.

Soil sample for percent moisture. Fill one 2-oz. container with sample representing the same locations where the 40-ml VOC vial sample was collected. Every effort should be made to obtain the percent moisture soil aliquot as close as possible to the location where the VOC sample was collected.

Duplicate samples will also be collected from the subsurface soils. Following the collection of the first set of VOC containers, collect the field duplicate from the same sampling interval.

Soil Sampling Procedures for SVOCs, Pesticide/PCBs, DRO, and Metals Including Cyanide (Composite)

1. Record all required data on the boring log which will also serve as the soil sample logsheet (Appendix D), including sampling equipment, sampling personnel, date, time, depth of sample, and sample analyses. The boring log will also contain soil descriptions, depth of strata changes, and sample depth intervals. The soil will be visually classified using the Unified Soil Classification System (USCS), as defined by the American Society for Testing and Materials (ASTM) D-2488-98, Standard Method for Classification of Soils.

2. Label appropriate sample jars with the sample location number, sampler's name, date, and analytical fractions.

3. Transfer the soil from the split-barrel sampler into a decontaminated stainless-steel bowl using only decontaminated stainless steel trowels, and homogenize the sample.

4. Remove any large particles such as gravel or artificial fill too large to be sent for analysis. Note the removal of material on the boring log.

5. Fill the appropriate sample containers.

6. For field duplicate samples, after homogenization fill one set of sample containers for the original sample and fill another set of sample containers for the field duplicate sample.

7. Ensure that the samples are properly labeled, maintained in coolers with ice, and that chain-of-custody procedures (described in Section 4) are followed. Package and ship the sample coolers to the appropriate laboratory for overnight delivery.

8. Decontaminate the sampling equipment before reuse (see Section 3.4.3).

Due to the potential for contamination to be encountered, care should be taken in handling all soil samples to ensure that the exterior of the sample containers are clean and free of soils before shipping. All laboratory analytical samples will be kept on ice in coolers and will be shipped with appropriate QA/QC samples, as described in Section 4.

Jar headspace VOC screening:

All soil samples collected will have an aliquot separated for analysis of total VOCs using jar headspace screening with a PID and FID. The procedure for the headspace screening is provided below:

1. Collect sufficient soil representative of the sample interval to half-fill one clean 8-oz. glass jar. Quickly cover the jar with clean aluminum foil and apply screw cap to tightly seal the jar. All appropriate analytical sampling procedures should be followed to maintain this sample matrix as representative and to avoid cross-contamination.

2. Vigorously shake jar for 15 seconds. Allow headspace development for at least 10 minutes. Where ambient temperatures are below 32°F (0°C), headspace development should be performed within a heated vehicle or building, though not at conditions above 80°F.

3. Remove screw lid/expose foil seal. Quickly puncture the foil seal with the Photovac Micro FID probe, to a point about one-half of the headspace depth. Exercise care to avoid uptake of water droplets or soil particulates.

4. Record highest FID reading as the jar headspace VOC concentration. The maximum response should occur between 2 to 5 seconds. Erratic meter response may occur with high organic vapor concentrations or high moisture content. If erratic responses are obtained, stop the headspace screening.

5. The Photovac Micro FID shall be used as the primary air-monitoring instrument. The Photovac 2020 PID will be used as a backup air monitoring device. Operation, maintenance, and calibration shall be performed in accordance with the manufacturer's specification which are provided in TtNUS SOP ME-12 (Photovac 2020 PID) (S5) and ME-15 (Photovac Micro FID) (S6). For jar headspace screening, the instrument calibration shall be checked/adjusted daily unless problems are encountered requiring more frequent calibration.

6. The Photovac MicroFID instrument has a digital (LED/LCD) display, which will not discern maximum headspace response unless the "maximum hold" feature has been cleared and reset between each reading. The instrument operator should clear and reset the maximum hold feature prior to each reading.

3.2.1.3 Bedrock Coring

At locations requiring a boring advanced into bedrock, the drill casing (minimum 4- inch ID) will be seated by driving or spinning the casing up to 2 feet into the bedrock surface. Bedrock coring will continue an estimated 30 feet into bedrock at each well cluster, using a double-walled NX or NQ core barrel, or equivalent. The length of bedrock coring is estimated to be 30 feet, unless observations of the recovered rock core and the borehole response to water level changes or the results of the packer testing indicate that the bedrock hole may be dry. If the rock hole is dry, the TtNUS field geologist will continue coring until groundwater enters the boring or observations of the recovered rock core indicate the potential for water bearing fractures. The packer test results will be evaluated by the project manager and the technical staff to determine if a monitoring well should be installed, or another action taken, such as drilling deeper or abandoning the borehole.

Rock Core Documentation

Each rock core will be documented in accordance with TtNUS SOP No. GH-1.3. At a minimum, the following information will be documented:

- Date of activity
- Name of person(s) overseeing work activity
- Project name
- Project number
- Boring number
- Core Run numbers

- Footage (depths)
- Recovery
- RQD (%)
- Box number and total number of boxes for that boring (Example: Box 1 of 2)
- Rock type
- Fracturing
- Weathering

3.2.1.4 Monitoring Well Installations

Procedures and rationale for bedrock and overburden monitoring well installations and related activities are described in this section. As part of Phase I drilling activities, an estimated ten borings will be completed as monitoring wells in shallow and deep overburden and in bedrock. Proposed locations of monitoring wells are presented on Figures 3-1 and 3-2. A rationale for these installations is provided on Table 3-1B.

The planned well installations will provide data on overburden and bedrock conditions in the Site vicinity and the groundwater gradient and flow regime around the Site, when used in conjunction with the existing wells on-site. Well clusters, each consisting of an overburden and bedrock well, will be located in areas of suspected contamination, as determined by the headspace screening results. It is anticipated that these well clusters will be located downgradient of potential "hot spots" within the Site, in order to identify concentrations of contaminants which may be discharging to Narragansett Bay or to the underlying groundwater.

TtNUS will subcontract a drilling company to advance the borings, collect soil and rock samples, conduct bedrock packer tests, and install monitoring wells on the Site. The subcontractor will also be responsible for developing the new monitoring wells with assistance from TtNUS.

Overburden Monitoring Well Construction

The overburden wells in each well cluster will be installed using standard drive and wash drilling methods. It is anticipated that four overburden wells will be installed using this method. The remaining two bedrock wells described in Table 3-1B will be nested with existing overburden wells on the site. The deepest boring at each cluster (bedrock or deep overburden borehole) will be advanced using split-barrel soil sampling. The evaluation of these soil samples including results of jar-headspace soil VOC screening and visual observations made by the site geologist will be used to determine the location/well screens/depths for the shallower borings within that cluster. The location of each shallower well in a cluster will be determined by the TtNUS Project Manager and site geologist based on a review of data gathered from the initial deepest boring.

Guidelines for monitoring well construction follow:

- All monitoring wells will be constructed of 2-inch ID, non-glued, flush joint, threaded, Schedule 40 PVC casing with either Teflon tape or O-rings at each joint. Well screens will be equipped with a screw-in PVC end plug.
- Well screen lengths will be determined based on the jar headspace VOC screening results, and visual observations such as soil classification, staining, and structure.
- Well screen slot sizes will be 10 (0.010-inch slot opening) or 20 (0.020-inch slot opening) based on visual soil classification in accordance with the Unified Soil Classification System.
- Due to the remote location of the Site, all wells will be completed with a steel protective casing that extends a minimum of 2 feet above ground surface.
- The drilling program will be designed to protect against cross-contamination of aquifers. This effort will be accomplished by telescoping casing and changing to new drilling fluids when it is necessary to penetrate a potential confining layer when drilling in known or suspected source areas of contamination.

The well screen lengths will be determined using the approach presented below.

Water table monitoring wells will be completed with 10 feet of well screen. If possible, the well screens will be set across the water table so that potential floating product can enter the well and the well screen will not become submerged during periods of high groundwater elevations.

Intermediate or deep overburden wells will be screened to monitor potential contaminant pathways, as determined from field screening and field observations. If field screening does not detect VOCs in the deeper soils, the well screen will be set in that portion of the overburden aquifer which is expected to have the highest hydraulic conductivity. The relative hydraulic conductivity will be estimated based on the type of material encountered. Portions of the aquifer that contain clean sand and gravel will be judged to have a higher hydraulic conductivity than areas that contain silt and clay.

The screen slot size will be determined based on the texture of the soil samples collected from the depths of the proposed well screen location. Medium to fine sand is expected to have a 10 slot well screen, and coarse sand and gravel is expected to have a 20 slot well screen. Sand pack materials will be selected to stabilize the aquifer formation during well development and provide a good hydraulic connection to the aquifer.

Additional details for completing overburden monitoring wells are presented in the drilling technical specification. The field geologist or engineer will document the well construction details on a well construction log (Appendix D). Any deviations from standard procedures will be documented using a Field Modification Record (FMR, Appendix D).

Bedrock Monitoring Well Installation

The bedrock monitoring well in each of the six clusters will be installed first. The boring will be advanced using standard drive and wash drilling methods and rotary rock coring methods. The bedrock portion of the boring will be evaluated using data gathered from the recovered rock core and packer tests. These data will be evaluated to select the pump intake interval for groundwater sampling and provide bulk hydraulic conductivity data on the bedrock aquifer. No well screens will be placed in the bedrock boreholes.

The bedrock monitoring wells will be constructed of 2-inch ID, non-glued, flush joint, threaded, Schedule 40 PVC riser casing with either an O-ring or Teflon-tape at each threaded joint. A tight fitting Teflon or PVC ring will be attached to the base of the PVC riser to form a base for the bedrock/overburden seal. This ring must fit snugly into the 2-foot deep 4-inch diameter bedrock socket and rest on the lip created at the transition point where the NX or NQ coring began. The entire PVC riser will rest on this ring which will also act as a trap for the bentonite seal & backfill materials. A stainless steel or PVC centralizer will be installed on the riser approximately 5 feet above the top of bedrock to ensure proper alignment and to secure the bentonite seal to the riser. The bedrock/overburden seal will consist of bentonite chips to a minimum of one foot above the bedrock surface. The placement of this seal will be monitored using a weighted tape to ensure a lack of bridging and proper placement. A bentonite and potable water slurry may be used as backfill above the seal following a minimum of one hour to allow the seal to set. Bentonite chips may be used as backfill in place of a slurry at the driller's discretion. The well installation will be completed with a protective casing. Additional well construction details will be provided in the drilling technical specification.

3.2.1.5 Well Development

Monitoring wells will be developed after installation to remove fines and sediments from around the well screens and to remove drill cuttings and residual drilling fluids from the area around the monitored interval. Development methods may include bailing, pumping, and surging, as determined by the field geologist. Well development will continue until turbidity is less than 5 nephelometric turbidity units (NTUs), determined by measuring the turbidity every 15 minutes, and until the pH and specific conductivity have stabilized, or until approved by the field geologist/engineer. A Horiba U-10 water quality meter and a Hach Turbidity meter will be used to collect the periodic readings during well development. If a well is not completely developed after 4 hours, the FOL will notify the TtNUS Project Manager. The TtNUS Project Manager will consult with technical advisors and the Navy to determine the course of action for continued development. In accordance with RIDEM policy, development water will be collected in 55-gallon drums (DOT Specification 17) or equivalent storage tanks until disposal can be arranged.

3.2.1.6 Hydraulic Conductivity Tests

Hydraulic conductivity tests will be performed on all bedrock and overburden monitoring wells installed. The objective of this testing is to provide estimates of the hydraulic conductivity of the aquifer materials within the study area. These data will be used, along with other data, to refine the site conceptual model and divide the study area into hydrostratigraphic units, if appropriate. Additional information on this process is provided in TtNUS SOP GH-2.5: Groundwater Contour Maps and Flow Rates, provided in Appendix C.

The bulk hydraulic conductivity of the bedrock will be calculated from packer testing conducted at each of the bedrock boreholes prior to completion as a monitoring well (Section 3.2.1.3). The bedrock packer tests should provide sufficient data to calculate the bulk hydraulic conductivity of the bedrock. Other hydraulic conductivity tests, such as slug tests and constant rate discharge tests will not be performed at these locations unless it is determined during the field activities that one of these other methods would be more efficient at providing similar information.

For overburden monitoring wells, hydraulic conductivity tests will be conducted using either a constant discharge or slug test method, as described in TtNUS SOP GH-2.4. To determine which method will be used, observations such as pumping rate and drawdown, made during the well development and groundwater sampling of the wells, will be evaluated to determine the appropriate test method. Monitoring wells that are determined to be capable of producing water at a reasonable rate will undergo constant rate discharge tests. Other wells that are not expected to support a constant rate discharge test will undergo slug tests.

Constant Rate Discharge Test Method

The majority of wells will be tested using a constant rate discharge test method. Following completion of the Phase 1 low-flow groundwater sampling, as described in Section 3.2.1.7, the pump used to purge and sample will remain in the well and the pumping rate will be increased to approximately 3 to 5 gallons per minute in an attempt to achieve a stabilized drawdown. Water level readings, pump discharge rates, and the time will be recorded approximately every 1-minute for approximately 15 minutes, when stabilization should have occurred. If drawdown reaches 10 feet in the bedrock wells or de-waters the well screen in the overburden wells and stabilization has not occurred, the pumping rate will be decreased and testing continued. The test will be completed after a minimum of 15 minutes has lapsed and stabilization has been achieved.

Slug Tests

To aid in determining the bulk hydraulic conductivity of the aquifer(s) beneath the Site, Rising head slug tests will be performed on overburden and bedrock wells that cannot support a constant rate discharge test. Falling head slug tests will only be conducted in wells with fully saturated well screens.

Prior to initiating slug testing at each selected well, the water level will be recorded to the nearest 0.01 foot using an electronic water level indicator. After the static water level has been established, a decontaminated PVC slug will be lowered into the well to a point just above the water table. The slug will be quickly inserted into the well so that its entire length will be below the water table. Water level measurements will be taken at regular intervals as the water "falls" back to its static level (falling head test).

Once the water level has returned to static conditions, a rising head test will be performed by withdrawing the slug from the well and measuring the water level at regular intervals, a procedure identical to that of the falling head test. The slug will be decontaminated between wells by rinsing with a non-phosphate soap solution, tap water rinse, distilled water rinse, and isopropanol rinse, followed by a final deionized water rinse.

In-situ hydraulic conductivity testing procedures and recording requirements are described in SOP GH-2.4.

The hydraulic conductivity data will be evaluated in the field and, if necessary, a decision will be made to determine if a second test is required to collect additional data in order to calculate accurate hydraulic conductivities from each location. In some cases, a different method or frequency of measurements may be required to collect sufficient data to calculate the hydraulic conductivity.

Bedrock Packer Testing

Each bedrock hole will be packer tested to determine what depths yield the most water. A "double packer" set up is expected at this time, which will allow for discrete zones of the bedrock to be isolated and tested. The interval between the packers is expected to be approximately 10 feet, however, actual packer test set-up and length between packers will be determined in the field based on spacing and frequency of water-bearing fractures identified in the rock core. The entire length of the bedrock hole, to the extent practicable, will be packer tested. The test intervals will be selected so that areas where groundwater movement is expected will be isolated and tested as a separate interval.

Once the packer testing set-up is assembled and installed to the initial interval to be tested, the packers will be inflated/expanded to isolate the testing interval. After packer inflation, water will be pumped through the packer testing set-up at the desired pressure(s), as directed by the TtNUS Site Representative. After water pressure has stabilized at the desired testing pressure, the test will begin. The flow meter reading at the beginning of the testing period will be recorded, then flow meter readings will be taken at 15 to 30 second intervals, for the duration of the test. A minimum of 5 minutes of readings will be taken for each test. If no measurable flow occurs within the 5 to 10 minutes of testing, a holding test will be performed for several minutes as a check. The flow or bypass valve will be shut to completely isolate the system, then the water pressure gauge checked for a drop in pressure over time. Each interval may be tested at three pressure intervals. Once one interval testing is complete, the downhole packer assembly will be moved to the next interval to be tested, and the testing procedures repeated.

The TtNUS field representative will record gauge pressures, water flow meter readings, and test times to calculate pumping rates on field forms. The TtNUS Project Manager and the Lead Geologist will review the results of the packer tests to determine the location of the pump intake for low-flow groundwater sampling. Packer test procedures are detailed in SOP GH-2.2, and the packer test assembly will be detailed in the Drilling Services Technical Specification.

3.2.1.7 Groundwater Sampling

Low-flow (low-stress) groundwater sampling will be conducted using the "EPA Region I Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells Revision 2", dated July 30, 1996, as amended 2002. The Phase 1 event involves sampling the groundwater monitoring wells installed on the Site during the Phase 1 drilling effort. Table 3-2 lists the proposed wells to be sampled, the number of samples to be collected, and the analyses to be performed during the groundwater monitoring for Phase 1. Phase 1 groundwater samples will be analyzed for VOCs, SVOCs, pesticides/PCBs, DRO, inorganics (total) including cyanide, alkalinity, sulfides, and (TOC). Table 3-3 presents the analytical methods proposed, and associated volume requirements, preservatives, and holding times. Newly installed wells will be sampled no less than 3 days following development.

Work elements for the low-flow groundwater sampling task include the following:

- Measure presence/absence of NAPL using ORS probe 1 day before sampling.
- Measure water levels in wells to be sampled 1 day before sampling.
- Purge wells using low-stress low-flow methodology.
- Measure pH, temperature, specific conductivity, redox potential, dissolved oxygen, turbidity, water level, and pumping rate periodically while water is being extracted from the well.
- Collect samples using the low-flow methodology.
- Document, package, and ship all samples for chemical analysis.

For bedrock wells, specific pump intake depths will be determined based on observations made during the advancement of the borings, testing conducted at each location such as packer testing, and on observations of well performance during well development activities. It is anticipated that either a bladder pump or submersible impeller pump will be required for the bedrock wells. For overburden wells, the pump intake will be set at the mid-point of the screen.

<u>Groundwater Level Measurements</u>

According to above, one day prior to groundwater sampling, water levels for all monitoring wells to be sampled will be measured on the same day, in as short a time span as possible. This information is used by the groundwater sampling crew to determine appropriate tubing/pump intake depths prior to groundwater sampling.

Groundwater levels will be measured with an electronic water-level indicator relative to a marked point on the top of the well casing, which will be the surveyed top of casing elevation. Water level measurements will be recorded to the nearest 0.01 foot. The measuring device will be calibrated and decontaminated prior to use and will be decontaminated between use in each well. Rinsing the device with deionized water will constitute the decontamination process unless significant contamination such as free product is encountered. If free product is encountered, liquinox soap and isopropyl alcohol will be used to remove the product, followed by rinsing with deionized water.

Well Purging Procedure

The procedures for purging and sampling of each well follow:

1. Using a water level indicator (M-scope) the depth to water in the well will be measured from a surveyed mark on each well and recorded to the nearest 0.01 foot, minimizing immersion of the M-scope probe within the standing water column to avoid disturbance of colloidal particles.

2. The required length of tubing will be calculated, measured, and marked with tape for attachment to the pump such that the intake end of tubing is placed at the midpoint of the saturated screened interval, (for overburden wells). Note that the tubing will be measured in order to allow a minimum distance between the well head and the discharge point (field testing equipment), to minimize temperature changes in the groundwater discharged from the well. Tubing will be disposed of after sampling is complete.

3. The tubing and pump will be slowly and smoothly lowered to the required depth to minimize the amount of mixing in the well. The tubing will be secured to the well casing (or PVC stick-up) to minimize movement.

4. The field testing equipment will be placed as close as possible to the well head/discharge tubing and adjusted to minimize air bubble entrapment within the tubing or flow-through cell.

5. The pump (submersible impeller type, or bladder pump) will be connected to the power supply (battery or other power source), and the power supply turned on (without starting the pump).

6. The depth to water with the tubing in the well will be re-measured and compared with the initial reading; if the readings vary by more than 0.05 foot, field personnel will wait for 5 minutes, remeasure the water, and begin pumping.

7. The pump will be started at the lowest flow setting (attempt 100 to 200 milliliters per minute). The pump start time will be recorded and the flow rate will be measured and recorded using a graduated cylinder and stopwatch. (Note that during the initial period of pumping, about 5 to 10 minutes, the depth to water in the well should be measured approximately once per minute to enable timely pump flow adjustments to minimize significant drawdown in the well).

8. The initial groundwater discharged from the tubing will be collected and field parameters (pH, temperature, conductivity, redox potential, turbidity, and dissolved oxygen) and time will be measured and recorded.

9. These field parameters (see above) and the depth to water in the well (using the M-scope) will be measured at 5-minute intervals (initially the water level will be measured more frequently, as discussed in step 7). The data and the associated time will be recorded on the low-flow sampling data sheet. Attempts will be made to maintain the drawdown in the well during pumping to 0.3 foot or less, by adjusting the pump flow rate. Drawdown for each well will vary depending on the recharge capacity of the well. Drawdown may exceed 0.3 foot in some wells.

10. Groundwater samples will be collected following the stabilization of measured field parameters. "Stabilization" is considered to be achieved when three consecutive readings, taken at 3- to 5- minute intervals, are within the following limits:

    - Turbidity (<5 NTU)
    - Dissolved oxygen (10 percent)
    - Temperature (3 percent)
    - pH (within 0.1 unit)

All measurements, except turbidity, must be obtained using a flow-through cell. A ball-valve diverter will be placed in-line in the discharge tubing prior to the inlet for the flow-through cell to allow the collection of the turbidity measurement sample aliquot prior to entering the flow-through cell. The minimum purge volume is the stabilized drawdown volume plus the extraction tubing volume. Detailed information on stabilization is found in the "EPA Region I Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells Revision 2", dated July 30, 1996, as amended 2002.

3.2.1.8 Long-Term Water Level Measurements

Following completion of the Phase 1 groundwater sampling event, the long-term water level measurement round will be initiated. This effort will include all groundwater sampling locations and two surface water gauging stations, which will each be equipped with pressure-transducer/data loggers to measure and record groundwater elevations in both shallow and deep overburden, bedrock, and in the adjacent bay.

The transducers will be secured within the protective steel casing of the wells and will be installed at a depth sufficient to ensure that the transducer will not become dewatered. The transducers will be installed and initialized to provide water level elevation data in order to reduce the amount of data conversion from depth to elevation, and thereby reduce opportunity for mathematical errors. The transducer cable will be marked with duct-tape at the appropriate location so that, if it becomes necessary to remove the transducer for maintenance, it can be replaced accurately. The transducer cable will be secured within the PVC so that no vertical movement can occur which could create error in the measurements during data retrieval activities and manual measurements.

Each transducer will be left in place for approximately five days during the summer/fall (low water table) season. All of the transducers will be initialized to collect readings every 15 minutes. The transducer data will be downloaded as needed onto a laptop computer and will be field-verified using manual measurements to identify potential problems such as instrument drift or failure.

3.2.2 Sediment Evaluation

A sediment evaluation will be performed to determine the presence of contaminants in the marine sediments adjacent to the Site. Navy guidance for sediment investigations is directed at identifying the source of the contamination through records search, preparing a Watershed Contaminated Source Document (WCSD) and controlling the source of the sediment contamination, prior to conducting a risk-based cleanup. The WCSD has been prepared and is presented in Section 2.3 of this Work Plan. The next step is to identify any contaminants at the Site that are attributable to the Site and not the watershed contaminants. This will be accomplished in order to determine if there is residual sediment contaminant presence in any depositional areas that can be associated with historic or continuing contaminant discharges from the Site.

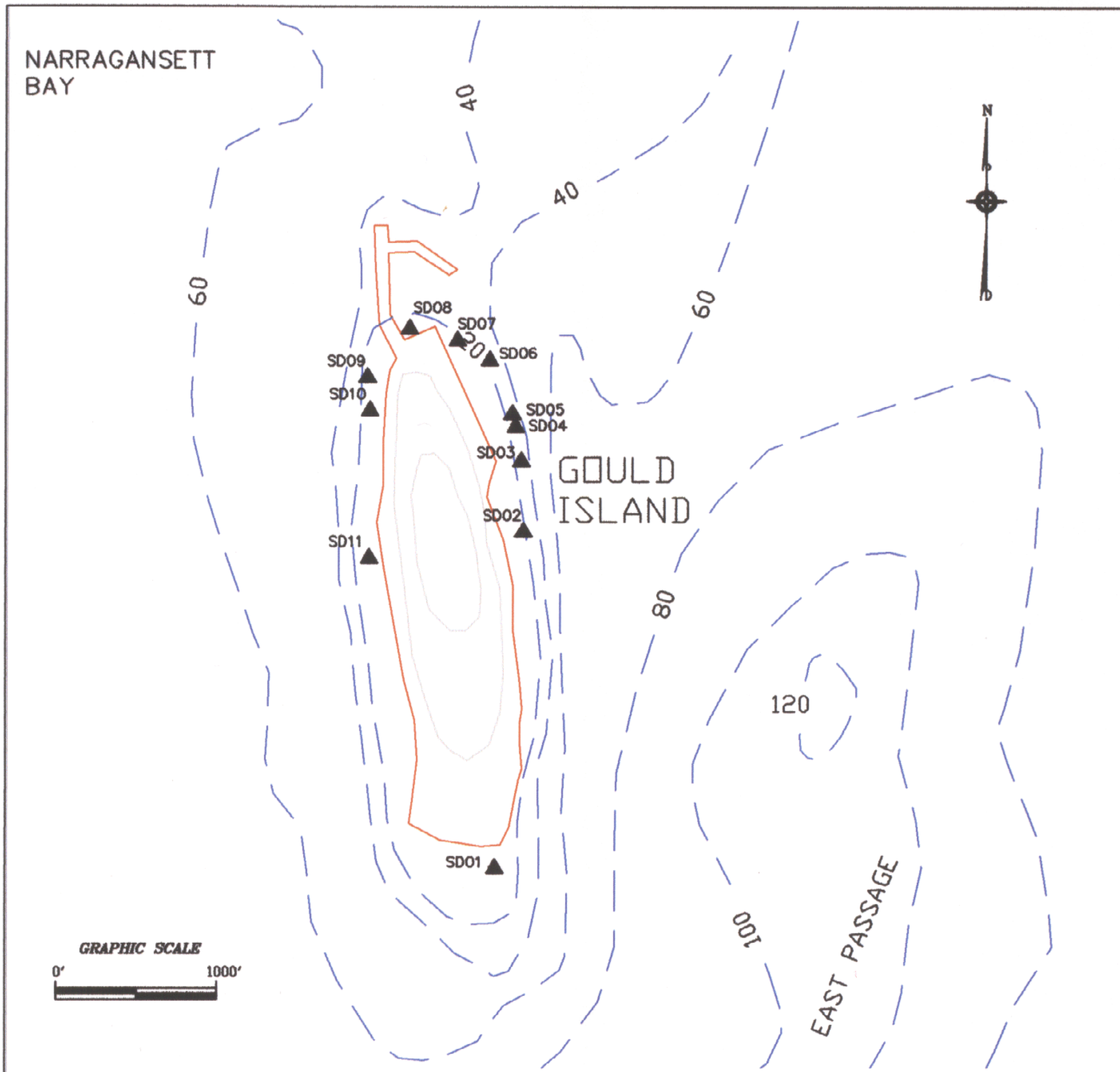
3.2.2.1 Sediment Sampling

Previous sampling of Narragansett Bay sediments adjacent to the Site showed slightly elevated levels of heavy metals in sediments (Appendix A). It is anticipated that eleven sediment stations will be sampled under this task to characterize present levels of site-related contaminants in the sediments near the electroplating discharge outfall, Building 32 sewerage outfalls, and stormwater outfalls. Surficial sediment samples will be collected from depositional areas in the Bay in the vicinity of the outfalls. If appropriate, additional sediment samples will be collected from depositional areas proximal to the existing terminus of each outfall pipeline. Samples will be collected from stations depicted in Figure 3-3, though these station locations may be adjusted pending sediment depositional area evaluation, discussed later in this section. A rationale for selection of these stations is provided on Table 3-1C.

It is anticipated that sediment samples will be collected from a boat using a stainless steel grab sampling device (eckman dredge or ponar sampler) or by divers using sediment core tube samplers. If possible, in shallow, near-shore areas, stainless steel hand tool samplers may be used for sample collection. If these surface sampling techniques are unsuccessful because of poor sampling conditions (dense or excessively rocky substrate), other methods (vibracoring, etc.) may be evaluated. Sediment samples will be collected from the 0 to 6 inch interval at all stations, measured from the sediment surface. In addition, if depositional sediments are located during the investigation, a 6 to 12 inch sample will also be collected from all such locations using a core sampling (or equivalent) device.

Samples will be collected for the full Target Compound List (TCL) organic analyses (VOCs, BNAs, pesticides, and PCBs), TAL metals, cyanide, TPH (DRO), grain size distribution analysis, total organic carbon (TOC), and Acid Volatile Sulfide/Simultaneously Extractable Metals (AVS/SEM) analyses. In addition, the temperature, pH, specific conductivity, dissolved oxygen, and salinity of the surface water will be measured at each sediment sample location. Table 3-2 lists the number of samples to be collected, and the analyses to be performed during the sediment sampling for Phase 1. Table 3-3 presents the analytical methods proposed, and associated volume requirements, preservatives, and holding times.

An undisturbed VOC sediment sample will be collected as soon as possible after the sediment sampler is retrieved. The VOC sample will be collected in accordance with the March 1997 (or most up-to-date version) of the Region I, EPA-New England <u>Draft Standard Operation Procedure for Soil Sample Collection and Handling for the Analysis of Volatile Organic Compounds</u>. After collecting the VOC sample the remaining sediment will be deposited into a stainless steel bowl. Attempts will be made to drain any excess standing water from the bowl without loss of fine materials from the sample. The



NOTES:

1. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. BOTTOM CONTOUR DATA INTERPRETED FROM NOAA CHART 13221, APRIL 15, 1995.

LEGEND

INTERPRETED DEPTH AT MEAN LOWER LOW WATER (NOAA 1995)

SHORELINE

SURFICIAL CONTOUR

SD01 PROPOSED SEDIMENT SAMPLE LOCATION

PROPOSED SEDIMENT SAMPLE STATIONS			FIGURE 3-3
SITE 17, GOULD ISLAND			TETRA TECH NUS, INC. 55 Jonspin Road Wilmington, MA 01887 (978)658-7899
NAVSTA NEWPORT, RHODE ISLAND			
DRAWN BY: R.G. DEWSNAP		REV.: 0	
CHECKED BY: S. PARKER		DATE: JANUARY 23, 2003	
SCALE: AS SHOWN		ACAD NAME: \DWG\5152\0430\FIG_3-3.DWG	

remaining portion of the sample will be thoroughly mixed and transferred to the appropriate sample containers.

Appropriate chain-of-custody procedures will be followed (see Section 4.5) and samples will be labeled, packaged, and shipped according to TtNUS SOPs described in Section 4.

Each sediment sample location will also be surveyed using standard transit survey technique or GPS survey equipment (GPS to sub-meter accuracy). Off-shore locations will be buoyed and buoy locations will be maintained until survey activities are complete. If GPS surveying is selected, three onshore reference points will be established (staked, nailed, or use of monitoring wells) as control points for integration of GPS data into land survey data. These three control points will also be surveyed during the onshore survey.

3.2.2.2 Offshore Outfall Tracking/Underwater Imaging

As described in Appendix A, the Building 32 interior drainage systems leading to outfalls on the east side of the island were identified, however, the current and original discharge points are only approximated. The objective of this task is to track and, if possible, locate the existing outfall locations for discharges from the Building 32 interior drainage system. In addition, this survey will be used to aid in identifying sediment types, locating sediment sampling locations, and evaluating habitat.

Methodologies used to track the outfalls beyond the seawall and to locate potential sediment sample stations will include: visual observations (near shore) at low tide; and video recording devices, e.g. submersible drop video camera for deep water areas; a boat for operational work near and seaward of the outfall positions; and if needed, a professional diver(s) with video or still camera capabilities. The outfall discharge points and potential sediment sampling locations will be recorded on video tape or still photographs, surveyed using GPS equipment to sub-meter accuracy, and temporarily marked using a weighted buoy marker. If feasible, a more permanent marker that is visible at low tide will be staked or anchored at the outfall discharge points. The underwater video operations will be performed by subcontractors to TtNUS operating under their own health and safety plans, and supervised by TtNUS technical staff.

As part of the underwater imaging activities discussed above, in addition to tracking the discharge line outfalls from the seawall, the bottom imaging scan will generally follow the island shoreline at a distance of up to 100 feet from the shoreline east and northwest of Building 32. Images from this scan will be used for the selection of depositional areas for sediment sampling. The entire survey tape will also be reviewed by an ecologist as part of the ecological assessment of the offshore environment.

3.2.3 UIC Evaluation

A UIC evaluation will be performed to identify and address any (UICs) that have yet not been identified, or have been identified though with no known function or purpose. This effort is planned to determine the purpose and role of underground structures that are not provided on historic drawings and records, and to map out any possible underground injection points.

Other floor drains and drainage systems from the demolished buildings have been identified and residue and concrete chip samples have been collected from those drains to determine contaminant discharge possibilities. This information is provided in Appendix A and is accounted for in the applicable sections of this Work Plan.

The location of one possible UIC is immediately north of the former electroplating room, identified by a manhole present in the floor of the former building. This manhole was found to contain liquids that were removed and disposed of, as described in Appendix A. Although this material has been removed, the purpose of the structure is not evident, as it is not shown on construction drawings or as-built plans reviewed for the building. It is therefore likely to have been added at some later date, after building construction, and the function of the space underneath is unknown.

Other floor and sump drains identified in previous inspections were evaluated and found to likely discharge to the ocean through the floor drain system described in Appendix A. Other UICs not previously identified (i.e. drains from other buildings not previously evaluated) that are found during RI field activities will be similarly evaluated.

Residue Sampling

Residue samples will be collected (if found) from within each new UIC identified. One sample will be collected from any depression or clean-out near the origin of the UIC, and one will be collected from the soil or sediment where that UIC is expected to discharge. Additional samples will be collected if standing fluids, water or obvious chemical contaminants are found to be present in the cleanouts or drainlines encountered. These residue samples will be collected to characterize contaminants in the UIC flow path and determine if a continuing source of contamination is present. If such material is not available, samples will not be collected. If possible, undisturbed VOC residue samples will be collected in accordance with the March 1997 (or most up-to-date version) of the Region I, EPA-New England Draft Standard Operation Procedure for Soil Sample Collection and Handling for the Analysis of Volatile Organic Compounds.

Due to the unclear or unknown number of UICs, and unknown number of accessible manholes/catch basins and cleanouts, a preliminary estimate of 10 residue samples is allotted in this Work Plan. These samples will be analyzed for the full TCL organic analyses (VOCs, BNAs, pesticides, and PCBs), TAL metals, cyanide, and TPH (DRO) analyses. Table 3-2 lists the number of samples anticipated to be collected, and the analyses to be performed. Table 3-3 presents the analytical methods proposed, and associated volume requirements, preservatives, and holding times.

3.2.4 Evaluation of Ecological Setting

Navy and EPA guidance for ecological risk assessment calls for a tiered, or stepped approach, as follows: 1) screening risk assessment, 2) baseline ecological risk assessment 3) develop site-specific risk-based cleanup values through risk management, and 4) monitor, if necessary, after cleanup. This Work Plan addresses only the performance of the first step, that of a screening level ecological risk assessment. Details on the performance of the risk assessment are provided in Section 5 of this Work Plan.

As a part of the determination of risk, the receptors must first be identified. This section describes an evaluation of the terrestrial and marine ecological settings for the purpose of identifying potential ecological receptors.

3.2.4.1 Ecological Setting

The ecology of the marine environment will be evaluated by a qualified ecologist during Sediment evaluation and sampling activities, and through low tide observations. A literature review will also be conducted, including a review of other offshore ecological risk assessments that have been performed in Narragansett Bay. Due to the proximity of the McAllister Point Landfill site to Gould Island (Figure 2-1) and the similarity of the settings between the two sites, the Marine Ecological Risk Assessment Report and any monitoring data available for the McAllister Point Landfill will be utilized to provide baseline information for the Gould Island marine ecology evaluation, in addition to the bottom imaging scan performed. In addition, a biologist's survey of the marine and upland areas will be performed to establish an ecological characterization of the Site. The ecological evaluation of the subtidal environment will include an evaluation of the imaging information collected, similar to that described in Section 3.2.2.2 of this Work Plan.

Due to the remaining conditions of the Site following building demolition, and the expected limited nature of terrestrial contamination as a result of the on-shore removal actions, the ecological walkover will focus on the intertidal and shoreline areas indicated in Figure 3-1. Evaluation of the terrestrial portions will be performed, although it is likely that the habitat quality of this area will be considered extremely limited, as it is in transition. The ecological walkover will involve the following evaluations:

- Identify the types and spatial extent of habitats that are present on and around the Site
- Identify the species and biological communities on and adjacent to the Site that may use these habitats and that may be potential receptors with regard to contaminants present in soils, sediments, and surface water at the Site
- Determine the presence of contaminated environmental media with regard to potential exposure of receptor species
- Identify on-site and adjacent wetlands, if appropriate, and their approximate boundaries; provide sketch maps of the wetland boundaries relative to the Site

3.2.4.2 Characterization of Habitats

The objective of the habitat characterization is to identify the nature and composition of non-marine animal and plant communities in the vicinity of the Site, to provide a basis for identifying potential receptors.

To characterize the habitats at and in the vicinity of the Site, biologists will provide: descriptions of the nature and composition of plant and animal communities at the Site and in the immediate vicinity of the Site; descriptions emphasizing wildlife species, their habitat, and key feeding behaviors; a description of significant habitat; and, if applicable, information on federal-or state-threatened or endangered species.

These tasks will be accomplished by conducting a literature search, a review of threatened and endangered species, and a field assessment (a qualitative survey of the flora and fauna).

3.2.4.3 Literature Review

The purpose of the literature review is to provide background information on the habitats and species of plants and animals expected to occur on the Site and in nearby areas, and the use of the general area by migrating or overwintering species. The review will include data or documents from the RIDEM, the US Fish and Wildlife Service (USFWS), and other data sources.

3.2.4.4 Review of Threatened And Endangered Species

RIDEM and USFWS Office of Endangered Species lists will be reviewed by TtNUS to identify endangered, protected, or threatened species that may inhabit or use the Newport area and the environments associated with the Site. This information will be checked with RIDEM and the USFWS, and maps will be provided at appropriate scales to show important habitats or nesting sites for these species. The determination of potential effects on any endangered or threatened species identified as being present in the Site area will receive special consideration.

3.2.4.5 Field Assessments

The purpose of this task is to provide qualitative field verification of the types of habitat and wildlife on and near the site.

The goal of the wildlife assessment is to provide site-specific observations concerning the diversity (type) of species rather than data for assessing population structure or community analyses. Since the objective is to provide an inventory of terrestrial fauna on site, the survey will be qualitative rather than quantitative. These data will be used to provide an informed site-specific basis for selecting potential ecological components (receptors).

The survey requires a site walkover. Positioning will be by "line of site" and will therefore be approximate. A field map will be used to guide the survey and to record observations. The walkover path will be planned and modified as appropriate in the field. The path will be dictated by the types of environments encountered and their extent, based on visual observations. Obvious habitat features that may be of particular value to wildlife will be examined closely. The course of the walkover will be based on such observations as nesting sites, physical signs of wildlife, audible signs of birds, changes in vegetation patterns, obvious changes in hydrologic conditions, changes in slope, and physical accessibility.

During the survey, observations will be made on major flora in habitat areas and bird, amphibian, reptile, and mammal sightings or their physical evidence, e.g., nesting sites, tracks.

Observations will be recorded on a base map to mark the locations of major habitat types and observations and notes will be recorded in a field log book by the biologist.

Lists of flora and fauna will be produced for inclusion in the report. These lists will be species-specific where possible. The method for species identification, i.e., visual sighting, identification by tracks or other physical evidence, and audible identification, will be included on the fauna list.

3.2.4.6 Data Products

The data products from the habitat survey will include tables and maps to facilitate a qualitative biological characterization of the Site and nearby areas. These will be provided in a report that will include:

- Narrative descriptions of the nature and composition of plant and animal communities in the immediate vicinity of the Site, referencing a combination of maps (for major vegetation and habitat types) and tables (for species composition of the communities),

- Descriptions emphasizing wildlife species observed, and their habitat requirements described in available literature, and key feeding habits; important features of the biology of these species, such as migrations into and out of the area through pertinent literature sources,

- A description of significant habitat, wetlands, waterbodies, and other resources in the immediate vicinity of the Site. As suggested by EPA guidance (1989), habitats that "are unique or unusual or necessary for continued propagation of key species" will be described. The USFWS and RIDEM are primary sources of this information,

- Information on federal or state threatened or endangered species.

These data products will be used to develop an ecological assessment for the Site, as described in Section 5.3.

3.3 PHASE 2 INVESTIGATIONS

The Phase 2 investigations are not scoped at this time. As stated in Section 3.1, the goals of the Phase 2 investigations are to collect, if necessary, additional data to determine extent of contaminant plumes (sediment and groundwater), and determine toxic effects on ecological receptors present. These investigations will be conducted, if necessary, to provide the following additional data endpoints:

- extent of groundwater or soil contamination,

- quantification of continued contaminant releases to Narragansett Bay through leaching, erosion, and/or groundwater flow,
- extent of site-related sediment contamination, and
- toxicity of site-related contaminants to the receptors present.

These Phase 2 efforts will be designed as appropriate to the data needs that are identified at the completion of Phase 1 investigations. This is a primary decision point that will require input from the Navy, EPA and RIDEM following completion, release and review of the Phase 1 data. Any necessary Phase 2 data collection efforts will be designed in an addendum to this Work Plan, to be developed after the data needs are identified.

3.4 SUPPORT EFFORTS

This section of the Work Plan describes some of the necessary efforts that will be conducted to support the data collection activities described in the preceeding sections. These efforts include decontamination, surveying, management of investigation-derived wastes, and other tasks common to the individual sampling programs.

3.4.1 Land Survey

Following the investigative work, a survey will be performed by a State of Rhode Island registered surveyor to identify locations of sample points, and other significant features identified during the RI. Surveys will be performed by a subcontractor supervised by TtNUS, working under the TtNUS Health and Safety Plan.

The base map presented in this Work Plan (Figure 2-2) will be used; however, locations of existing buildings and study area boundaries may be confirmed by survey.

The survey will be conducted to establish relative locations of sample points. Survey control will be maintained by tying into either the State of Rhode Island or United States Geological Survey (USGS) grid systems. Elevations will be referenced to a USGS benchmark and the mean low water level. Horizontal and vertical measurements will be made relative to on-site control points.

All surveyed features will be horizontally located to within plus or minus 0.1 foot. Tops of PVC well risers will be located to plus or minus 0.01 foot vertically.

At a minimum, it is expected that the following features will be surveyed:

- Expected discharge outfall points at the seawall related to Building 32
- Manholes and catch basins near and inside Building 32
- Boring locations and monitoring well elevations
- Other onshore sample locations
- Three GPS control points from sediment sampling

In addition, any sample collection points that are established during the investigation will be surveyed. Sediment sample locations will be buoyed and located using GPS with submeter accuracy, as described in Section 3.2.2 of this Work Plan.

Surveyed points will be mapped with AutoCAD V14.0 or a compatible system. The survey subcontractor will provide hard-copy prints and disk versions of the survey information for each survey operation. Survey points for each task will be set on a different "layer" of the AutoCAD data such that printouts of sample collection points can be made specific to each task or any group of tasks.

3.4.2 Management of Investigation-Derived Waste (IDW)

Waste materials that will be generated during the field investigation may include drill cuttings and fluids, well purge and development water, decontamination fluids, wash water from steam cleaning, disposable sampling equipment, and used personal protective equipment (PPE). Procedures for handling investigation-derived waste are described in this section which has been prepared in accordance with TtNUS SOP SA-7.1, Section 5.4 (Waste Handling) (S7).

TtNUS will be responsible for removing and disposing of all investigative waste materials (well purge water, soil cuttings, and PPE) following completion of the field investigation program. This waste disposal program will be conducted following each element of work described in the previous sections. In this manner, large quantities of wastes will not be stockpiled for disposal at the end of the investigation program.

Containers of IDW will be labeled as to their point of origin and date collected. Containers of IDW that are found to be hazardous will be characterized and disposed of within 90 days.

3.4.2.1 Solid Wastes

Personal protective equipment (gloves, tyvek coveralls, and disposable boots) will be decontaminated, double bagged, and disposed of in an off-site industrial dumpster.

3.4.2.2 Soil Wastes

Excess drill cuttings, discarded sample material, and other soil wastes will be containerized. Laboratory analysis of samples collected during the investigation program will be used to further characterize the materials, as required by state and federal disposal requirements. Soils that are found to not contain elevated concentrations of contaminants will be replaced onsite as general fill. Soils that are confirmed by laboratory analysis to contain elevated concentrations of contaminants will be further characterized for off-site disposal.

Additional samples will be analyzed for other parameters to characterize the waste. Typical disposal parameters are listed below:

- TCLP Volatile Organic Compounds
- TCLP PCB/Pesticide Compounds
- TCLP Metals
- Flash Point, Reactivity, Corrosivity
- Free Liquid

Analysis of representative samples of waste materials for disposal parameters will be the responsibility of an outside disposal subcontractor. All soil wastes will be shipped off site by this same subcontractor.

3.4.2.3 Aqueous Wastes

Decontamination fluids, well purge and development water, and drilling fluids will be initially contained in 55-gallon drums or portable tanks approved for such use. Drums of drilling water, purge water, and development water originating from wells that are found to not contain elevated concentrations of contaminants through laboratory analysis will be discharged onsite. Containers of water that are confirmed by laboratory analysis to contain elevated concentrations of contaminants will be further characterized for off-site disposal. The wastes will be sampled for RCRA disposal parameters based on the findings of the field investigation, and in accordance with state waste generation and disposal requirements. Samples may be analyzed for, but not limited to VOCs, SVOCs, metals, PCBs, pesticides, TPH, and flash point. This material will be combined at the conclusion of the project and shipped off site for disposal in accordance with RIDEM, USEPA, and DOT Regulations.

3.4.3 Cleaning and Decontamination of Equipment

The detailed decontamination and waste handling procedures are described in this section, which has been prepared in accordance with TtNUS SOP No. SA-7.1 (S7), provided in Appendix C. The non-disposable equipment that will come in contact with the media to be sampled and that will require decontamination is identified in the table below. If the equipment is new, the initial cleaning will consist only of a soapy water wash followed by a tap water and distilled water rinse. Sterile disposable sampling materials, which are individually packaged from the factory, will not require decontamination before sampling. Disposable sampling materials will be kept to a minimum to reduce the amount of solid IDW requiring disposal.

Equipment that will be used at Site 17 to collect soil sediment, and groundwater samples is summarized in the table below:

Matrix: Soil/Sediment	**Parameter**	
Equipment	**Inorganics including Cyanide**	**VOCs, SVOCs, DRO, Pesticide/PCBs, Percent Moisture**
Drill Rig & Drilling tools	X	X
Stainless Steel Trowel	X	X
Split-Barrel sampler	X	X
Stainless Steel Bowl	X	X
Disposable Sampling Trowel	X	X
Sediment Core tube	X	X
Sediment Dredge	X	X
Disposable 10 ml Syringe		X
PPE	X	X

Matrix: Groundwater	**Parameter**	
Equipment	**Inorganics including Cyanide**	**VOCs, SVOCs, DRO, Pesticide/PCBs, TOC, Alkalinity, Sulfides**
HDPE Tubing	X	X
Pharmaceutical-grade Silicon Tubing	X	X
Submersible or Bladder Pumps	X	X
PPE	X	X

Decontamination Procedure

Prior to the initiation of drilling activities all downhole drilling equipment and tools will be high-pressure steam-cleaned at a decontamination pad to be constructed within a fenced-off portion of the Site. This decontamination procedure will apply to all downhole tools, the rear of the drill rig, any tool racks, and support vehicles which come into contact with contaminated media. This decontamination procedure will be repeated between each soil boring and prior to demobilization of this equipment from the Site.

Non-disposable sampling equipment such as split-barrel samplers, submersible pumps and stainless-steel supplies will undergo the following decontamination procedure prior to being used and between samples:

1. Potable water rinse
2. Alconox or Liquinox detergent wash
3. Potable water wash
4. Deionized water rinse
5. Pesticide-grade Isopropyl alcohol rinse
6. Pesticide-grade Hexane rinse
7. Thorough deionized water rinse
8. Air dry
9. Wrap in aluminum foil for storage if not reused

3.4.4 Field Equipment Calibration

Calibration of direct read instruments will be performed as described in this section, which has been prepared in accordance with TtNUS SOP SA-2.2 (Air Monitoring) (S8).

The Field Instrument Calibration TtNUS SOPs for the Photovac 2020 PID (ME-12) and the Photovac MicroFID (ME-15) (S4 & S5) are provided in Appendix C, in addition to TtNUS SOP SA-2.2, Section 5.6 (Air Monitoring and Sampling) (S8). Field analytical equipment will be calibrated prior to each day's use and the calibration will be checked at the end of each day. The calibration procedures used will conform to manufacturer's standard instructions. Records of instrument calibration will be maintained in a field log. Field personnel will maintain instrument manuals onsite.

3.4.5 Field Equipment Maintenance, Testing, and Inspection Requirements

Equipment, instruments, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's recommendations. Manufacturer's procedures identify the schedule for servicing critical items in order to minimize the downtime of the measurement system. It will be the responsibility of the operator to adhere to this maintenance schedule and to promptly arrange any necessary service required. Service to the equipment, instruments, tools, gauges, etc. shall be performed by qualified personnel. Logs shall be established to record maintenance, service procedures, and schedules. Maintenance records will be documented and traceable to the specific equipment, instruments, and gauges.

3.4.6 Inspection and Acceptance Requirements for Supplies/Sample Containers

It will be the responsibility of the field personnel to inspect all supplies to be used as part of the field program during mobilization and use. Supplies to be inspected include sampling equipment, field meters and sampling containers.

If the field crew encounters any problem with supplies, the FOL should consult the QA/QC Officer for instruction. The QA/QC Officer will instruct the field crew on any corrective actions that should be implemented.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

This QA/QC section includes information on: project quality objectives, project action limits, measurement performance criteria, sample collection documentation requirements, the sample identification system, sample handling and custody procedures, analytical method requirements, sampling and analytical quality control requirements, analytical documentation and data management, data validation and verification requirements and procedures, and QA assessment and management efforts.

Achieving the study objectives for this RI requires that the data collected from the field conform to an appropriate level of quality, adequate to be used for baseline risk assessments. The quality of a data set is measured by certain characteristics of the data, which are described in this section.

4.1 PROJECT QUALITY OBJECTIVES

The data quality objectives (DQOs) and methods for sampling and laboratory analysis described in this Work Plan are selected to provide data adequate for the development or support of human health and ecological risk assessments. If the data meet the quality objectives, they will be used for this endpoint. This section describes how project data will be reconciled with the project quality objectives, how data quality issues will be addressed, and how limitations on the use of the data will be reported and handled.

TtNUS will perform data quality assessment including:

- Review of the DQOs and sampling design, review of the proper validation level.
- Review of the data validation criteria, measurement performance criteria, and method QC/QL requirements.
- Correlation of data to expected values, comparison to available historical data (as applicable).

To meet these ends, the following data quality indicators will be evaluated:

<u>Completeness</u>

The data validator performs a Completeness Evidence Audit. During this audit, the validator checks that the laboratory has provided all of the documentation required to support the reported analytical results. If any documentation is missing from the data package, the data validator contacts the laboratory and requests a resubmittal. If the laboratory fails to resubmit a requested document, the data validator notes this on an internal Inventory Sheet and in the data validation cover letter. The Lead Chemist determines if the missing information makes the data unusable. The Project Manager and data user determine if any missing data is crucial to achieve the data quality objectives.

Precision

Field duplicated sample results, laboratory duplicate results, instrument variation, sampling techniques, as well as possible sample transport problems, sample matrix problems, and sample heterogeneity will be assessed to determine the overall data precision. If the project goals for precision are not met, the potential need for re-sampling will be evaluated.

Accuracy

During data validation, the data validator evaluates the accuracy of the analytical data using the laboratory and field blanks, laboratory control samples, and check standards.

The laboratory and field blanks will indicate accuracy and potential contamination bias of the analytical data results. The analytical accuracy and bias will be evaluated based on the analysis of check standards, matrix spike recoveries, surrogate recoveries, laboratory control samples, calibration linearity, and calibration verification results.

The data assessment will compare overall contamination and accuracy/bias of the groundwater, soil, and potential NAPL sample data from the Site. The impact of any qualitative and /or quantitative data trend will be evaluated. Limitations on the use of the data will be evaluated as well as assessment of the potential need for re-sampling.

Sample Representativeness

The overall and specific sampling group representativeness for the samples for each media will be evaluated. If the data are not usable to address and answer the environmental questions and or to support the project decision making requirements due to problems with sampling techniques, sampling preservation, analytical holding times, or field duplicate results, the need for additional sampling will be evaluated. Such evaluations will be held internally, and then with the project group as necessary.

Sensitivity and Quantitation Limits

The required quantitation limits to meet the project action limits specified in Section 4.2 will be evaluated. The sample quantitation limits, the low point instrument calibration standard, matrix interferences, and sample dilutions will be evaluated to assess if the sensitivity goals were met. The specific sensitivity of the data packages results will be evaluated for each medium in order to clearly differentiate between usable and unusable data for the various data users.

Comparability

Standard methods of sample collection and analysis is expected to produce comparable data. Data from each matrix collected at the Site will be compared with historical and expected analytical results. Limitation of the data use by matrix and/or specific sampling locations will be identified.

4.2 PROJECT ACTION LIMITS

Project action limits are provided in this section for both screening data and for fixed laboratory analytical data.

The project action limits for laboratory data have been established for the adequate evaluation of human health and ecological risks in accordance with current risk assessment guidelines. Additionally, similar risk assessments performed for other Navy sites in Narragansett Bay were considered for use of screening benchmarks, and for action limits for contaminants of potential concern.

In the conceptual model presented in Section 2 of this Work Plan, potential contaminants of concern were identified based on former use of the Site, formerly detected contaminants, likely discharge conditions, and fate and transport mechanisms. While these contaminants are only a small subset of the contaminants that may be present and potentially posing a risk to human and/or ecological receptors, they do provide a basis of understanding of what contaminants are likely to be present. In this section, the Project Action Limits are established for these and similar contaminants.

Tables 4-1A through 4-3D present the project action limits that will serve as target concentrations for the chemical data provided by the fixed analytical laboratories. Sources of the values are provided as table footnotes and references.

Project action limits, for the purposes of this section, are specific criteria against which the analytical data will be initially screened to support the preparation of human health and ecological risk assessments.

Project action limits in Tables 4-1A through 4-3D are collections of toxicity and regulatory benchmarks applicable to each media. Soil action limits are based on ecological screening criteria and RIDEM Direct Exposure Criteria for soils. Groundwater action limits are based on RIDEM and federal drinking water standards. Sediment action limits are based on RIDEM direct exposure criteria and ecological reference information. Where multiple benchmarks were located, the lower benchmark was selected.

The primary effort in collecting the benchmarks cited was to determine benchmarks for the "primary site contaminants", or those contaminants that are indicative of releases of chemicals or chemical wastes from activities associated with the topedo overhaul operations (i.e. cyanide, and chlorinated solvents). A secondary effort was made to include benchmarks for contaminants that were previously detected on site, even though they may not be present as a direct result of Building 32 activities. Finally, some benchmarks were included for contaminants that have not yet been found on site, but are likely to be.

Many contaminants in the standard analysis groups do not have adequate toxicological data to establish risk-based screening criteria that can be used as project action limits. For these contaminants, the action limit is identified as "Not Available", and the method detection limit is presumed to be adequate to determine the presence of the contaminant at measurable concentrations at the site. As a part of the data evaluation, surrogate toxicity information from other related compounds may be approved for use in the screening process. Finally, any literature and/or regulatory information pertaining to these contaminants that comes to light during the study will be used if applicable.

It should be noted that the citation of any risk screening benchmark or reference value for any contaminant does not necessarily indicate that those contaminants should be associated with site related contamination. Inclusion of any contaminants in the site model would need to show not only a completed exposure pathway, but also a connection of those contaminants to the site history and operations.

Analytical action limits have also been established for the use of the screening data collected. The screening analysis will be conducted in order to determine relative high and low concentrations of total volatile organics present in soils during the boring program. The presence of higher concentrations of volatile organics will indicate presence of organic contaminants in saturated or unsaturated soils. This data will be used along with characterization of the soils by the Unified Soil Classifcation System (USCS) to determine vertical positions of the well screens installed. Because the screening data are only to be used in a qualitative manner, the screening action limits are set at the detection limit of the instruments.

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TABLE 4-1A
GROUNDWATER – VOLATILE CONTAMINANTS OF CONCERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (μg/L)	Project Quantitation Limit (μg/L)	Analytical Method		Achievable Laboratory Limits	
				MDLs(3)	Method QLs (μg/L)	MDLs(3)	QLs (μg/L)
Dichlorodifluoromethane	75-71-8	NA	10	<10	10	<10	10
Chloromethane	74-87-3	NA	10	<10	10	<10	10
Bromomethane	74-83-9	NA	10	<10	10	<10	10
***Vinyl Chloride**	75-01-4	2(1)	10	<10	10	<10	10
Chloroethane	75-00-3	NA	10	<10	10	<10	10
*Methylene Chloride	75-09-2	NA	10	<10	10	<10	10
*Acetone	67-64-1	NA	10	<10	10	<10	10
Methyl Acetate	79-20-9	NA	10	<10	10	<10	10
*Carbon Disulfide	75-15-0	NA	10	<10	10	<10	10
Trichlorofluoromethane	75-69-4	NA	10	<10	10	<10	10
1,1-Dichloroethene	75-35-4	7(1)	10	<10	10	<10	10
1,1,2-Trichloro-1,2,2-trifluoro-ethane	76-13-1	NA	10	<10	10	<10	10
1,1- Dichloroethane	75-34-3	NA	10	<10	10	<10	10
Methyl tert-Butyl Ether	1634-04-4	NA	10	<10	10	<10	10
***cis-1,2- Dichloroethene**	156-59-2	70(1)	10	<10	10	<10	10
***trans-1,2- Dichloroethene**	156-60-5	100(1)	10	<10	10	<10	10
*Chloroform	67-66-3	NA	10	<10	10	<10	10
1,2- Dichloroethane	107-06-2	NA	10	<10	10	<10	10
2-Butanone	78-93-3	NA	10	<10	10	<10	10
1,1,1-Trichloroethane	71-55-6	200(1)	10	<10	10	<10	10
Bromochloromethane	74-97-5	NA	10	<10	10	<10	10
Cyclohexane	110-82-7	NA	10	<10	10	<10	10
Carbon Tetrachloride	56-23-5	NA	10	<10	10	<10	10
*Bromodichloromethane	75-27-4	NA	10	<10	10	<10	10
Methylcyclohexane	108-87-2	NA	10	<10	10	<10	10
1,2-Dichloropropane	78-87-5	5(1)	10	<10	10	<10	10
cis-1,3- Dichloropropene	10061-01-5	NA	10	<10	10	<10	10
***Trichloroethene**	79-01-6	5(1)	10	<10	10	<10	10
*Dibromochloromethane	124-48-1	NA	10	<10	10	<10	10
1,1,2- Trichloroethane	79-00-5	NA	10	<10	10	<10	10
*Benzene	71-43-2	5(1)	10	<10	10	<10	10
Trans-1,3-Dichloropropene	10061-02-6	NA	10	<10	10	<10	10
Isopropylbenzene	98-82-8	NA	10	<10	10	<10	10
Bromoform	75-25-2	NA	10	<10	10	<10	10
4-Methyl-2-Pentanone	108-10-1	NA	10	<10	10	<10	10
2-Hexanone	591-78-6	NA	10	<10	10	<10	10
***Tetrachlorethene**	127-18-4	5(1)	10	<10	10	<10	10
1,1,2,2- Tetrachlorethane	79-34-5	NA	10	<10	10	<10	10
Ethylene Dibromide	106-93-4	NA	10	<10	10	<10	10
***Toluene**	108-88-3	1000(1)	10	<10	10	<10	10
1,2-Dibromoethane	106-93-4	NA	10	<10	10	<10	10
Chlorobenzene	108-90-7	NA	10	<10	10	<10	10
***Ethylbenzene**	100-41-4	700(1)	10	<10	10	<10	10
Styrene	100-42-5	100(1)	10	<10	10	<10	10
***Total Xylenes**	1330-20-7	10,000(1)	10	<10	10	<10	10
1,3-Dichlorobenzene	541-73-1	600(1)	10	<10	10	<10	10
1,4- Dichlorobenzene	106-46-7	75(1)	10	<10	10	<10	10
1,2- Dichlorobenzene	95-50-1	600(1)	10	<10	10	<10	10
1,2-Dibromo-3-chloropropane	96-12-8	NA	10	<10	10	<10	10
1,2,4-Trichlorobenzene	120-82-1	70(1)	10	<10	10	<10	10

Notes:

NA Not applicable or Not Available

* Contaminant previously detected on site

Bold Text – Believed to be a site contaminant, based on historical use of the site.

(1) Rhode Island DEM Rules and Regulations for Hazardous Waste Sites, Upper Concentration Limit for GA Groundwater

TABLE 4-1B
GROUNDWATER – SEMIVOLATILE CONTAMINANTS OF CONCERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (µg/L)	Project Quantitation Limit (µg/L)	Analytical Method		Achievable Laboratory Limits	
				MDLs(4)	Method QLs (µg/L)	MDLs(4)	QLs (µg/L)
Benzaldehyde	100-52-7	NA	10		10		10
Phenol	108-95-2	NA	10		10		10
Bis-(2-Chloroethyl) ether	111-44-4	NA	10		10		10
2-Chlorophenol	95-57-8	NA	10		10		10
2-Methylphenol	95-48-7	NA	10		10		10
2,2-oxybis(1-Chloropropane)	108-60-1	NA	10		10		10
Acetophenone	98-86-2	NA	10		10		10
4-Methylphenol	106-44-5	NA	10		10		10
N-Nitroso-di-n propylamine	621-64-7	NA	10		10		10
Hexachloroethane	67-72-1	NA	10		10		10
Nitrobenzene	98-95-3	NA	10		10		10
Isophorone	78-59-1	NA	10		10		10
2-Nitrophenol	88-75-5	NA	10		10		10
2,4-Dimethylphenol	105-67-9	NA	10		10		10
Bis(2-Chloroethoxy) methane	111-91-1	NA	10		10		10
2,4-Dichlorophenol	120-83-2	NA	10		10		10
***Naphthalene**	91-20-3	20(6)	10		10		10
4-Chloroaniline	106-47-8	NA	10		10		10
Hexachlorobutadiene	87-68-3	NA	10		10		10
Caprolactam	105-60-2	NA	10		10		10
4-Chloro-3-methylphenol	59-50-7	NA	10		10		10
***2-Methylnaphthalene**	91-57-6	NA	10		10		10
Hexachlorocyclopentadiene	77-47-4	NA	10		10		10
2,4,6-Trichlorophenol	88-06-2	NA	10		10		10
2,4,5-Trichlorophenol	95-95-4	NA	25		25		25
1,1'-Biphenyl	92-52-4	NA	10		10		10
2-Chloronaphthalene	91-58-7	NA	10		10		10
2-Nitroaniline	88-74-4	NA	25		25		25
Dimethylphthalate	131-11-3	NA	10		10		10
2,6-Dinitrotoluene	606-20-2	NA	10		10		10
Acenaphthylene	208-96-8	NA	10		10		10
3-Nitroaniline	99-09-2	NA	25		25		25
***Acenaphthene**	83-32-9	710(5)	10		10		10
2,4-Dinitrophenol	51-28-5	NA	25		25		25
4-Nitrophenol	100-02-7	NA	25		25		25
***Dibenzofuran**	132-64-9	NA	10		10		10
2,4-Dinitrotoluene	121-14-2	NA	10		10		10
Diethylphthalate	84-66-2	NA	10		10		10
***Fluorene**	86-73-7	1100(7)	10		10		10
4-Chlorophenyl-phenyl ether	7005-72-3	NA	10		10		10
4-Nitroaniline	100-01-6	NA	25		25		25
4,6-Dinitro-2-methylphenol	534-52-1	NA	25		25		25
N-Nitroso diphenylamine	86-30-6	NA	10		10		10
4-Bromophenyl-phenylether	101-55-3	NA	10		10		10
Hexachlorobenzene	118-74-1	1(6)	10		10		10
Atrazine	1912-24-9	NA	10		10		10
Pentachlorophenol	87-86-5	1(6)	25		25		25

TABLE 4-1B (CONT.)
GROUNDWATER – SEMIVOLATILE CONTAMINANTS OF CONCERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, RHODE ISLAND
PAGE 2 OF 2

Analytes	CAS Number	Project Action Limit (µg/L)	Project Quantitation Limit (µg/L)	Analytical Method		Achievable Laboratory Limits	
				MDLs(4)	Method QLs (µg/L)	MDLs(4)	QLs (µg/L)
***Phenanthrene**	85-01-8	5(5)	10		10		10
Anthracene	120-12-7	NA	10		10		10
Carbazole	86-74-8	NA	10		10		10
Di-n-butylphthalate	84-74-2	NA	10		10		10
Fluoranthene	206-44-0	16(5)	10		10		10
Pyrene	129-00-0	NA	10		10		10
Butylbenzylphthalate	85-68-7	NA	10		10		10
3,3'-Dichlorobenzidine	91-94-1	NA	10		10		10
Benzo (a) anthracene	56-55-3	27(1)	10		10		10
Chrysene	218-01-9	14(2)	10		10		10
***bis(2-Ethylhexyl) phthalate**	117-81-7	12,000(3)	10		10		10
Di-n-octylphthalate	117-84-0	NA	10		10		10
Benzo (b) fluoroanthene	205-99-2	14(2)	10		10		10
Benzo (k) fluoroanthene	207-08-9	NA	10		10		10
Benzo (a) pyrene	50-32-8	0.2(6)	10		10		10
Indeno (1,2,3-cd)-pyrene	193-39-5	NA	10		10		10
Dibenzo (a,h)-anthracene	53-70-3	NA	10		10		10
Benzo (g,h,i) perylene	191-24-2	14(2)	10		10		10

Notes:
NA Not Applicable or Not Available
* **contaminant previously detected on site in groundwater**
(1) Oak Ridge National Laboratory, Summary of Conventional Benchmarks for Priority Contaminants in Fresh Water (1996)
(2) Oak Ridge National Laboratory, Summary of Conventional Benchmarks for Priority Contaminants in Fresh Water 1996, Surrage Value for Similar Compounds (PAHs use value for benzo(a)pyrene); assumes a 1000:1 dilution in groundwater to bay discharge
(3) Rhode Island DEM Ambient Water Quality Criteria and Guideline, Freshwater Chronic Criteria; assumes a 1000:1 dilution in groundwater to bay discharge
(4) MDL for CLP laboratory not available
(5) Buchman, 1999, assumes a 1000:1 dilution in groundwater to bay discharge
(6) Rhode Island DEM Rules and Regulations for Hazardous Waste Sites, Upper Concentration Limit for GA Groundwater
(7) AWQC for human consumption of water and biota, 2002

TABLE 4-1C
GROUNDWATER - PESTICIDE/PCB CONTAMINANTS OF CONCERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (µg/L)	Project Quantitation Limit (µg/L)	Analytical Method		Achievable Laboratory Limits	
				MDLs(3)	Method QLs (µg/L)	MDLs(3)	QLs (µg/L)
alpha-BHC	319-84-6	NA	0.05		0.05		0.05
beta-BHC	319-85-7	NA	0.05		0.05		0.05
delta-BHC	319-86-8	NA	0.05		0.05		0.05
gamma-BHC	58-89-9	NA	0.05		0.05		0.05
Heptachlor	76-44-8	3.6(2)	0.05		0.05		0.05
Aldrin	309-00-2	NA	0.05		0.05		0.05
Heptachlor epoxide	1024-57-3	3.6(2)	0.05		0.05		0.05
Endosulfan I	959-98-8	NA	0.05		0.05		0.05
Dieldrin	60-57-1	1.9(1)	0.10		0.10		0.10
4,4'-DDE	72-55-9	1(2)	0.10		0.10		0.10
Endrin	72-20-8	NA	0.10		0.10		0.10
Endosulfan II	33213-65-9	NA	0.10		0.10		0.10
4,4'-DDD	72-54-8	1(2)	0.10		0.10		0.10
Endosulfan sulfate	1031-07-8	NA	0.10		0.10		0.10
4,4'-DDT	50-29-3	1(2)	0.10		0.10		0.10
Methoxychlor	72-43-5	NA	0.50		0.50		0.50
Endrin ketone	53494-70-5	NA	0.10		0.10		0.10
Endrin aldehyde	7421-93-4	NA	0.10		0.10		0.10
alpha-Chlordane	5103-71-9	2(1)	0.05		0.05		0.05
gamma-Chlordane	5103-74-2	2(1)	0.05		0.05		0.05
Toxaphene	8001-35-2	NA	5.0		5.0		5.0
Aroclor-1016	12674-11-2	0.5(1)	1.0		1.0		1.0
Aroclor-1221	11104-28-2	0.5(1)	2.0		2.0		2.0
Aroclor-1232	11141-16-5	0.5(1)	1.0		1.0		1.0
Aroclor-1242	53469-21-9	0.5(1)	1.0		1.0		1.0
***Aroclor-1248**	12672-29-6	0.5(1)	1.0		1.0		1.0
***Aroclor-1254**	11097-69-1	0.5(1)	1.0		1.0		1.0
***Aroclor-1260**	11096-82-5	0.5(1)	1.0		1.0		1.0

Notes:
- * **Previously Detected in groundwater**
- NA Not Applicable or Not Available
- (1) Federal Recommended Water Quality Criteria for Priority Toxic Pollutants, Saltwater CCC
- (2) Rhode Island DEM Rules and Regulations for Hazardous Waste Sites, Upper Concentration Limit for GA Groundwater
- (3) MDLs to be determined during laboratory contract procedures.

TABLE 4-1D
GROUNDWATER –INORGANIC CONTAMINANTS OF CONCERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (μg/L)	Project Quantitation Limit (μg/L)	Analytical Method		Achievable Laboratory Limits	
				MDLs(3)	Method QLs (μg/L)	MDLs(3)	QLs (μg/L)
Aluminum	7429-90-5	NA	200		200		200
Antimony	7440-36-0	6(4)	60		60		60
***Arsenic**	7440-38-2	36(1)	10		10		10
***Barium**	7440-39-3	2000(4)	200		200		200
Beryllium	7440-41-7	4(4)	5		5		5
***Cadmium**	7440-43-9	5(4)	5		5		5
Calcium	7440-70-2	NA	5000		5000		5000
***Chromium**	7440-47-3	50(1,2)	10		10		10
Cobalt	7440-48-4	NA	50		50		50
Copper	7440-50-8	NA	25		25		25
Cyanide	57-12-5	200(4)	10		10		10
Iron	7439-89-6	NA	100		100		100
***Lead**	7439-92-1	8.1(1)	3		3		3
Magnesium	7439-95-4	NA	5000		5000		5000
Manganese	7439-96-5	NA	15		15		15
***Mercury**	7439-97-6	0.94(1)	0.2		0.2		0.2
Nickel	7440-02-0	100(4)	40		40		40
Potassium	7440-09-7	NA	5000		5000		5000
Selenium	7782-49-2	50(4)	5		5		5
***Silver**	7440-22-4	1.9(1)	10		10		10
Sodium	7440-23-5	NA	5000		5000		5000
Thallium	7440-28-0	2(4)	10		10		10
Vanadium	7440-62-2	NA	50		50		50
Zinc	7440-66-6	81(1)	20		20		20

Notes:
NA Not Applicable or Not Available
* **Previously Detected Contaminant**
(1) Federal Recommended Water Quality Criteria for Priority Toxic Pollutants, Saltwater CCC
(2) For Chromium IV
(3) MDLs to be determined during laboratory subcontracting procedures.
(4) Rhode Island DEM Rules and Regulations for Hazardous Waste Sites, Upper Concentration Limit for GA Groundwater

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TABLE 4-2A
SOIL – VOLATILE ORGANIC CONTAMINANTS OF CONCERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (µg/kg) (1)	Project Quantitation Limit (µg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs(2) (µg/kg)	Method QLs (µg/kg)	MDLs(2) (µg/kg)	QLs (µg/kg)
Dichlorodifluoromethane	75-71-8	NA	600		600		600
*Chloromethane	74-87-3	NA	600		600		600
Bromomethane	74-83-9	800	600		600		600
***Vinyl Chloride**	75-01-4	20	600		600		600
*Chloroethane	75-00-3	NA	600		600		600
*Methylene Chloride	75-09-2	45,000	600		600		600
*Acetone	67-64-1	7,800,000	600		600		600
Methyl Acetate	79-20-9	NA	600		600		600
*Carbon Disulfide	75-15-0	NA	600		600		600
Trichlorofluoromethane	75-69-4	NA	600		600		600
1,1-Dichloroethene	75-35-4	200	600		600		600
1,1,2-Trichloro-1,2,2-trifluoro-ethane	76-13-1	NA	600		600		600
1,1- Dichloroethane	75-34-3	920,000	600		600		600
Methyl tert-Butyl Ether	1634-04-4	NA	600		600		600
***Cis-1,2- Dichloroethene**	156-59-2	630,000	600		600		600
***Trans-1,2- Dichloroethene**	156-60-5	1,100,000	600		600		600
Chloroform	67-66-3	1200	600		600		600
*1,2- Dichloroethane	107-06-2	900	600		600		600
***2-Butanone**	78-93-3	$1x10^7$	600		600		600
1,1,1-Trichloroethane	71-55-6	540,000	600		600		600
Bromochloromethane	74-97-5	NA	600		600		600
Cyclohexane	110-82-7	NA	600		600		600
Carbon Tetrachloride	56-23-5	1500	600		600		600
Bromodichloromethane	75-27-4	10,000	600		600		600
*Methylcyclohexane	108-87-2	NA	600		600		600
1,2-Dichloropropane	78-87-5	1900	600		600		600
Cis-1,3- Dichloropropene	10061-01-5	NA	600		600		600
***Trichloroethene**	79-01-6	13,000	600		600		600
Dibromochloromethane	124-48-1	7600	600		600		600
1,1,2- Trichloroethane	79-00-5	3600	600		600		600
*Benzene	71-43-2	2,500	600		600		600
Trans-1,3-Dichloropropene	10061-02-6	NA	600		600		600
*Isopropylbenzene	98-82-8	NA	600		600		600
Bromoform	75-25-2	NA	600		600		600
4-Methyl-2-Pentanone	108-10-1	NA	600		600		600
2-Hexanone	591-78-6	NA	600		600		600
***Tetrachlorethene**	127-18-4	12,000	600		600		600
1,1,2,2- Tetrachlorethane	79-34-5	2200	600		600		600
Ethylene Dibromide	106-93-4	10	600		600		600
***Toluene**	108-88-3	190,000	600		600		600
1,2-Dibromoethane	106-93-4	NA	600		600		600
Chlorobenzene	108-90-7	210,000	600		600		600
***Ethylbenzene**	100-41-4	71,000	600		600		600
Styrene	100-42-5	NA	600		600		600
***Total Xylenes**	1330-20-7	110,000	600		600		600
1,3-Dichlorobenzene	541-73-1	430,000	600		600		600
1,4- Dichlorobenzene	106-46-7	27,000	600		600		600
1,2- Dichlorobenzene	95-50-1	510,000	600		600		600
1,2-Dibromo-3-chloropropane	96-12-8	NA	600		600		600
1,2,4-Trichlorobenzene	120-82-1	96,000	600		600		600

Notes:

NA Not Applicable or Not Available

* Previously detected on site

Bold Text – Believed to be site contaminant, based on historical use on site

(1) Rhode Island DEM Rules and Regulations for Hazardous Waste Release Sites. Direct Exposure Criteria for Residential Use Soils.

(2) MDLs to be determined during laboratory contract procedures.

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TABLE 4-2B
SOIL – SEMIVOLATILE ORGANIC CONTAMINANTS OF CONERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit(1) (μg/kg)	Project Quantitation Limit (μg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs(2)	Method QLs (μg/kg)	MDLs(2)	QLs (μg/kg)
***Benzaldehyde**	100-52-7	6100(3)	330		330		330
Phenol	108-95-2	$6x10^6$	330		330		330
Bis-(2-Chloroethyl) ether	111-44-4	600	330		330		330
2-Chlorophenol	95-57-8	60,000	330		330		330
2-Methylphenol	95-48-7	NA	330		330		330
2,2-oxybis(1-Chloropropane)	108-60-1	NA	330		330		330
Acetophenone	98-86-2	NA	330		330		330
4-Methylphenol	106-44-5	310(3)	330		330		330
N-Nitroso-di-n propylamine	621-64-7	NA	330		330		330
Hexachloroethane	67-72-1	46,000	330		330		330
Nitrobenzene	98-95-3	NA	330		330		330
Isophorone	78-59-1	NA	330		330		330
2-Nitrophenol	88-75-5	NA	330		330		330
***2,4-Dimethylphenol**	105-67-9	$1.4x10^6$	330		330		330
Bis(2-Chloroethoxy) methane	111-91-1	NA	330		330		330
2,4-Dichlorophenol	120-83-2	30,000	330		330		330
***Naphthalene**	91-20-3	54,000	330		330		330
4-Chloroaniline	106-47-8	310,000	330		330		330
Hexachlorobutadiene	87-68-3	8,200	330		330		330
Caprolactam	105-60-2	NA	330		330		330
4-Chloro-3-methylphenol	59-50-7	NA	330		330		330
***2-Methylnaphthalene**	91-57-6	123,000	330		330		330
Hexachlorocyclopentadiene	77-47-4	NA	330		330		330
2,4,6-Trichlorophenol	88-06-2	58	330		330		330
2,4,5-Trichlorophenol	95-95-4	330	830		830		830
***1,1'-Biphenyl**	92-52-4	800	330		330		330
2-Chloronaphthalene	91-58-7	NA	330		330		330
2-Nitroaniline	88-74-4	NA	830		830		830
Dimethylphthalate	131-11-3	$1.9x10^6$	330		330		330
2,6-Dinitrotoluene	606-20-2	NA	330		330		330
***Acenaphthylene**	208-96-8	23,000	330		330		330
3-Nitroaniline	99-09-2	NA	830		830		830
***Acenaphthene**	83-32-9	43,000	330		330		330
2,4-Dinitrophenol	51-28-5	160,000	830		830		830
4-Nitrophenol	100-02-7	NA	830		830		830
***Dibenzofuran**	132-64-9	290(3)	330		330		330
2,4-Dinitrotoluene	121-14-2	900	330		330		330
Diethylphthalate	84-66-2	340,000	330		330		330
***Fluorene**	86-73-7	28,000	330		330		330
4-Chlorophenyl-phenyl ether	7005-72-3	NA	330		330		330
4-Nitroaniline	100-01-6	NA	830		830		830
4,6-Dinitro-2-methylphenol	534-52-1	NA	830		830		830
N-Nitroso diphenylamine	86-30-6	NA	330		330		330
4-Bromophenyl-phenylether	101-55-3	NA	330		330		330
Hexachlorobenzene	118-74-1	400	330		330		330
Atrazine	1912-24-9	NA	330		330		330

TABLE 4-2B (CONT.)
SOIL - SVOC TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 2

Analytes	CAS Number	Project Action Limit(1) (µg/kg)	Project Quantitation Limit (µg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs(2)	Method QLs (µg/kg)	MDLs(2)	QLs (µg/kg)
Pentachlorophenol	87-86-5	5300	830		830		830
***Phenanthrene**	85-01-8	40,000	330		330		330
***Anthracene**	120-12-7	35,000	330		330		330
***Carbazole**	86-74-8	24(3)	330		330		330
***Di-n-butylphthalate**	84-74-2	NA	330		330		330
***Fluoranthene**	206-44-0	20	330		330		330
***Pyrene**	129-00-0	13,000	330		330		330
Butylbenzylphthalate	85-68-7	NA	330		330		330
3,3'-Dichlorobenzidine	91-94-1	NA	330		330		330
***Benzo (a) anthracene**	56-55-3	900	330		330		330
***Chrysene**	218-01-9	400	330		330		330
***bis(2-Ethylhexyl) phthalate**	117-81-7	46,000	330		330		330
Di-n-octylphthalate	117-84-0	NA	330		330		330
***Benzo (b) fluoroanthene**	205-99-2	900	330		330		330
***Benzo (k) fluoroanthene**	207-08-9	900	330		330		330
***Benzo (a) pyrene**	50-32-8	400	330		330		330
***Indeno (1,2,3-cd)-pyrene**	193-39-5	900	330		330		330
***Dibenzo (a,h)-anthracene**	53-70-3	400	330		330		330
***Benzo (g,h,i) perylene**	191-24-2	800	330		330		330

Notes:
NA Not Applicable or Not Available
* **Contaminant previously detected on site**
(1) Rhode Island DEM Rules and Regulations for Hazardous Waste Release Sites, Direct Exposure Criteria for Residential Use Soils, unless otherwise noted.
(2) MDL for CLP laboratory not available
(3) Region IX PRGs for Residential Soils

TABLE 4-2C
SOIL – PESTICIDES/PCB CONTAMINANTS OF CONCERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit(1) (μg/kg)	Project Quantitation Limit (μg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs(2)	Method QLs (μg/kg)	MDLs(2)	QLs (μg/kg)
alpha-BHC	319-84-6	NA	1.7		1.7		1.7
beta-BHC	319-85-7	NA	1.7		1.7		1.7
delta-BHC	319-86-8	NA	1.7		1.7		1.7
gamma-BHC	58-89-9	NA	1.7		1.7		1.7
Heptachlor	76-44-8	NA	1.7		1.7		1.7
Aldrin	309-00-2	NA	1.7		1.7		1.7
Heptachlor epoxide	1024-57-3	NA	1.7		1.7		1.7
Endosulfan I	959-98-8	NA	1.7		1.7		1.7
*Dieldrin	60-57-1	40	3.3		3.3		3.3
*4,4'-DDE	72-55-9	NA	3.3		3.3		3.3
Endrin	72-20-8	NA	3.3		3.3		3.3
*Endosulfan II	33213-65-9	NA	3.3		3.3		3.3
*4,4'-DDD	72-54-8	NA	3.3		3.3		3.3
Endosulfan sulfate	1031-07-8	NA	3.3		3.3		3.3
*4,4'-DDT	50-29-3	NA	3.3		3.3		3.3
Methoxychlor	72-43-5	NA	17		17		17
Endrin ketone	53494-70-5	NA	3.3		3.3		3.3
Endrin aldehyde	7421-93-4	NA	3.3		3.3		3.3
*alpha-Chlordane	5103-71-9	NA	1.7		1.7		1.7
*Gamma-Chlordane	5103-74-2	500	1.7		1.7		1.7
Toxaphene	8001-35-2	500	170		170		170
Aroclor-1016	12674-11-2	10,000	33		33		33
Aroclor-1221	11104-28-2	10,000	67		67		67
Aroclor-1232	11141-16-5	10,000	33		33		33
Aroclor-1242	53469-21-9	10,000	33		33		33
***Aroclor-1248**	12672-29-6	10,000	33		33		33
***Aroclor-1254**	11097-69-1	10,000	33		33		33
***Aroclor-1260**	11096-82-5	10,000	33		33		33

Notes:
NA Not applicable, or not available
* Contaminant previously detected on site
Bold Text – Considered to be a site contaminant, based on historical presence on site.
(1) Rhode Island DEM Rules and Regulations for Hazardous Waste Release Sites, Direct Exposure Criteria for Residential Use Soils
(2) MDLs to be established during laboratory subcontracting procedures

TABLE 4-2D
SOIL – INORGANIC CONTAMINANTS AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (1) (mg/kg)	Project Quantitation (3) Limit (mg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs(2)	Method QLs (mg/kg)	MDLs(2)	QLs (mg/kg)
*Aluminum	7429-90-5	NA	1.5 – 7.4		40		40
*Antimony	7440-36-0	10	0.3 – 1.0		12		12
*Arsenic	7440-38-2	1.7	0.3 – 1.1		2		2
***Barium**	7440-39-3	5500	0.02 – 0.2		40		40
*Beryllium	7440-41-7	0.4	0.02 – 0.2		1		1
***Cadmium**	7440-43-9	39	0.04 – 0.2		1		1
*Calcium	7440-70-2	NA	0.5 – 4.0		1000		1000
***Chromium**	7440-47-3	1400	0.06 – 0.4		2		2
***Cobalt**	7440-48-4	900(4)	0.06 – 0.4		10		10
***Copper**	7440-50-8	3100	0.12 – 1.2		5		5
***Cyanide**	57-12-5	200					
***Iron**	7439-89-6	23,000(4)	2.2 – 6.4		20		20
***Lead**	7439-92-1	150	0.12 – 0.52		0.6		0.6
*Magnesium	7439-95-4	NA	0.54 – 40		1000		1000
*Manganese	7439-96-5	390	0.02 – 0.2		3		3
***Mercury**	7439-97-6	23	0.02 – 0.2		0.1		0.1
***Nickel**	7440-02-0	1000	0.08 – 0.4		8		8
*Potassium	7440-09-7	NA	5.2 – 10		1000		1000
***Selenium**	7782-49-2	330	0.34 – 1.0		1		1
***Silver**	7440-22-4	200	0.04 – 0.6		2		2
*Sodium	7440-23-5	NA	1.3 – 80		1000		1000
*Thallium	7440-28-0	5.5	0.5 – 1.6		2		2
*Vanadium	7440-62-2	550	0.06 – 0.4		10		10
***Zinc**	7440-66-6	6000	0.1 – 0.7		4		4

Notes:
NA Not applicable
* Previously detected on site
Bold Text – considered site contaminant, based on historical use of the site.
(1) Rhode Island DEM Rules and Regulations for Hazardous Waste Release Sites, Direct Exposure Criteria for Residential Use Soils
(2) MDLs to be established during laboratory contracting
(3) Range of typical IDLs from current CLP laboratories
(4) EPA Region IX PRGs for residential use soils, 2002

TABLE 4-3A
SEDIMENT – VOLATILE ORGANIC CONTAMINANTS OF CONCERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (μg/kg)	Project Quantitation Limit (μg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs(1) (μg/kg)	Method QLs (μg/kg)	MDLs(1) (μg/kg)	QLs (μg/kg)
Dichlorodifluoromethane	75-71-8	NA	600		600		600
*Chloromethane	74-87-3	NA	600		600		600
Bromomethane	74-83-9	NA	600		600		600
***Vinyl Chloride**	75-01-4	NA	600		600		600
*Chloroethane	75-00-3	NA	600		600		600
*Methylene Chloride	75-09-2	NA	600		600		600
*Acetone	67-64-1	NA	600		600		600
Methyl Acetate	79-20-9	NA	600		600		600
*Carbon Disulfide	75-15-0	NA	600		600		600
Trichlorofluoromethane	75-69-4	NA	600		600		600
1,1-Dichloroethene	75-35-4	NA	600		600		600
1,1,2-Trichloro-1,2,2-trifluoro-ethane	76-13-1	NA	600		600		600
1,1- Dichloroethane	75-34-3	NA	600		600		600
Methyl tert-Butyl Ether	1634-04-4	NA	600		600		600
***cis-1,2- Dichloroethene**	156-59-2	NA	600		600		600
***trans-1,2- Dichloroethene**	156-60-5	NA	600		600		600
Chloroform	67-66-3	NA	600		600		600
1,2- Dichloroethane	107-06-2	NA	600		600		600
***2-Butanone**	78-93-3	NA	600		600		600
1,1,1-Trichloroethane	71-55-6	NA	600		600		600
Bromochloromethane	74-97-5	NA	600		600		600
Cyclohexane	110-82-7	NA	600		600		600
Carbon Tetrachloride	56-23-5	NA	600		600		600
Bromodichloromethane	75-27-4	NA	600		600		600
*Methylcyclohexane	108-87-2	NA	600		600		600
1,2-Dichloropropane	78-87-5	NA	600		600		600
Cis-1,3- Dichloropropene	10061-01-5	NA	600		600		600
***Trichloroethene**	79-01-6	1600(2)	600		600		600
Dibromochloromethane	124-48-1	NA	600		600		600
1,1,2- Trichloroethane	79-00-5	NA	600		600		600
*Benzene	71-43-2	NA	600		600		600
Trans-1,3-Dichloropropene	10061-02-6	NA	600		600		600
*Isopropylbenzene	98-82-8	NA	600		600		600
Bromoform	75-25-2	NA	600		600		600
4-Methyl-2-Pentanone	108-10-1	NA	600		600		600
2-Hexanone	591-78-6	NA	600		600		600
***Tetrachlorethene**	127-18-4	530(2)	600		600		600
1,1,2,2- Tetrachlorethane	79-34-5	NA	600		600		600
Ethylene Dibromide	106-93-4	NA	600		600		600
***Toluene**	108-88-3	670(2)	600		600		600
1,2-Dibromoethane	106-93-4	NA	600		600		600
Chlorobenzene	108-90-7	820(2)	600		600		600
***Ethylbenzene**	100-41-4	3600(2)	600		600		600
Styrene	100-42-5	NA	600		600		600
***Total Xylenes**	1330-20-7	NA	600		600		600
1,3-Dichlorobenzene	541-73-1	NA	600		600		600
1,4- Dichlorobenzene	106-46-7	NA	600		600		600
1,2- Dichlorobenzene	95-50-1	NA	600		600		600
1,2-Dibromo-3-chloropropane	96-12-8	NA	600		600		600
1,2,4-Trichlorobenzene	120-82-1	NA	600		600		600

Notes:

NA Not Applicable or Not Available

* Previously Detected on site

Bold Text – Believed to be a site contaminant, based on historical use of site

(1) MDLs to be determined during laboratory contract procedures

(2) EPA, OSWER Sediment Screening Benchmarks, 1996

TABLE 4-3B
SEDIMENT – SEMIVOLATILE ORGANIC CONTAMINANTS OF CONERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (µg/kg)	Project Quantitation Limit (µg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs(1)	Method QLs (µg/kg)	MDLs(1)	QLs (µg/kg)
***Benzaldehyde**	100-52-7	NA	330		330		330
Phenol	108-95-2	NA	330		330		330
Bis-(2-Chloroethyl) ether	111-44-4	NA	330		330		330
2-Chlorophenol	95-57-8	NA	330		330		330
2-Methylphenol	95-48-7	NA	330		330		330
2,2-oxybis(1-Chloropropane)	108-60-1	NA	330		330		330
Acetophenone	98-86-2	NA	330		330		330
***4-Methylphenol**	106-44-5	670(6)	330		330		330
N-Nitroso-di-n propylamine	621-64-7	NA	330		330		330
Hexachloroethane	67-72-1	NA	330		330		330
Nitrobenzene	98-95-3	NA	330		330		330
Isophorone	78-59-1	NA	330		330		330
2-Nitrophenol	88-75-5	NA	330		330		330
***2,4-Dimethylphenol**	105-67-9	29(6)	330		330		330
Bis(2-Chloroethoxy) methane	111-91-1	NA	330		330		330
2,4-Dichlorophenol	120-83-2	NA	330		330		330
***Naphthalene**	91-20-3	160(2)	330		330		330
4-Chloroaniline	106-47-8	NA	330		330		330
Hexachlorobutadiene	87-68-3	NA	330		330		330
Caprolactam	105-60-2	NA	330		330		330
4-Chloro-3-methylphenol	59-50-7	NA	330		330		330
***2-Methylnaphthalene**	91-57-6	70(2)	330		330		330
Hexachlorocyclopentadiene	77-47-4	NA	330		330		330
2,4,6-Trichlorophenol	88-06-2	NA	330		330		330
2,4,5-Trichlorophenol	95-95-4	NA	830		830		830
***1,1'-Biphenyl**	92-52-4	NA	330		330		330
2-Chloronaphthalene	91-58-7	NA	330		330		330
2-Nitroaniline	88-74-4	NA	830		830		830
Dimethylphthalate	131-11-3	NA	330		330		330
2,6-Dinitrotoluene	606-20-2	NA	330		330		330
***Acenaphthylene**	208-96-8	44(2)	330		330		330
3-Nitroaniline	99-09-2	NA	830		830		830
Acenaphthene	83-32-9	16(2)	330		330		330
2,4-Dinitrophenol	51-28-5	NA	830		830		830
4-Nitrophenol	100-02-7	NA	830		830		830
***Dibenzofuran**	132-64-9	2000(4)	330		330		330
2,4-Dinitrotoluene	121-14-2	NA	330		330		330
Diethylphthalate	84-66-2	NA	330		330		330
***Fluorene**	86-73-7	19(2)	330		330		330
4-Chlorophenyl-phenyl ether	7005-72-3	NA	330		330		330
4-Nitroaniline	100-01-6	NA	830		830		830
4,6-Dinitro-2-methylphenol	534-52-1	NA	830		830		830
N-Nitroso diphenylamine	86-30-6	NA	330		330		330
4-Bromophenyl-phenylether	101-55-3	NA	330		330		330
Hexachlorobenzene	118-74-1	NA	330		330		330
Atrazine	1912-24-9	NA	330		330		330

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TABLE 4-3B (CONT.)
SOIL – SVOC TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 2

Analytes	CAS Number	Project Action Limit (µg/kg)	Project Quantitation Limit (µg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs(1)	Method QLs (µg/kg)	MDLs(1)	QLs (µg/kg)
Pentachlorophenol	87-86-5	NA	830		830		830
***Phenanthrene**	85-01-8	240(2)	330		330		330
***Anthracene**	120-12-7	85.3(2)	330		330		330
***Carbazole**	86-74-8	NA	330		330		330
***Di-n-butylphthalate**	84-74-2	11,000(4)	330		330		330
***Fluoranthene**	206-44-0	600(2)	330		330		330
***Pyrene**	129-00-0	665(2)	330		330		330
Butylbenzylphthalate	85-68-7	11,000(4)	330		330		330
3,3'-Dichlorobenzidine	91-94-1	NA	330		330		330
***Benzo (a) anthracene**	56-55-3	261(2)	330		330		330
***Chrysene**	218-01-9	384(2)	330		330		330
***bis(2-Ethylhexyl) phthalate**	117-81-7	NA	330		330		330
Di-n-octylphthalate	117-84-0	NA	330		330		330
***Benzo (b) fluoroanthene**	205-99-2	4,000(5)	330		330		330
***Benzo (k) fluoroanthene**	207-08-9	240(3)	330		330		330
***Benzo (a) pyrene**	50-32-8	430(2)	330		330		330
***Indeno (1,2,3-cd)-pyrene**	193-39-5	200(3)	330		330		330
***Dibenzo (a,h)-anthracene**	53-70-3	63.4(2)	330		330		330
***Benzo (g,h,i) perylene**	191-24-2	170(3)	330		330		330

Notes:

NA Not applicable, or Not available
* **Previously detected on site**
(1) MDLs to be determined during laboratory contract procedures
(2) ERL (Long et.al. 1991, 1995)
(3) LEL (OEME, 1993
(4) EPA OSWER Sediment Screening Benchmarks, 1996
(5) EPA ARCS No Effects Concentration for Sediment
(6) Washington Apparent Effects Threshold Sediment Benchmarks

TABLE 4-3C
SEDIMENT – PESTICIDES/PCB CONTAMINANTS OF CONCERN AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (μg/kg)	Project Quantitation Limit (μg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs(4)	Method QLs (μg/kg)	MDLs(4)	QLs (μg/kg)
alpha-BHC	319-84-6	6(2)	1.7		1.7		1.7
beta-BHC	319-85-7	5(2)	1.7		1.7		1.7
delta-BHC	319-86-8	3(2)	1.7		1.7		1.7
gamma-BHC	58-89-9	3(2)	1.7		1.7		1.7
Heptachlor	76-44-8	5(2)	1.7		1.7		1.7
Aldrin	309-00-2	2(2)	1.7		1.7		1.7
Heptachlor epoxide	1024-57-3	5(2)	1.7		1.7		1.7
Endosulfan I	959-98-8	29(3)	1.7		1.7		1.7
*Dieldrin	60-57-1	52(3)	3.3		3.3		3.3
*4,4'-DDE	72-55-9	2.2(1)	3.3		3.3		3.3
Endrin	72-20-8	20(3)	3.3		3.3		3.3
*Endosulfan II	33213-65-9	14(3)	3.3		3.3		3.3
*4,4'-DDD	72-54-8	8(2)	3.3		3.3		3.3
Endosulfan sulfate	1031-07-8	5.4(3)	3.3		3.3		3.3
*4,4'-DDT	50-29-3	1.58(1)	3.3		3.3		3.3
Methoxychlor	72-43-5	19(3)	17		17		17
Endrin ketone	53494-70-5	20(3)	3.3		3.3		3.3
Endrin aldehyde	7421-93-4	20(3)	3.3		3.3		3.3
*alpha-Chlordane	5103-71-9	7(2)	1.7		1.7		1.7
*gamma-Chlordane	5103-74-2	7(2)	1.7		1.7		1.7
Toxaphene	8001-35-2	NA	170		170		170
*Aroclor-1016	12674-11-2	7(2)	33		33		33
*Aroclor-1221	11104-28-2	5(2)	67		67		67
*Aroclor-1232	11141-16-5	5(2)	33		33		33
*Aroclor-1242	53469-21-9	5(2)	33		33		33
***Aroclor-1248**	12672-29-6	30(2)	33		33		33
***Aroclor-1254**	11097-69-1	60(2)	33		33		33
***Aroclor-1260**	11096-82-5	5(2)	33		33		33

Notes:
NA Not applicable
* Previously detected on site
Bold text – considered to be site contaminant, based on historical presence on site
(1) ERL (Long et.al. 1991, 1995)
(2) LEL (OMOE, 1993)
(3) EPA OSWER Sediment Screening Benchmarks, 1996
(4) MDLs to be determined during laboratory contract procedures

TABLE 4-3D
SEDIMENT – INORGANIC CONTAMINANTS AND OTHER TARGET ANALYTES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Analytes	CAS Number	Project Action Limit (mg/kg)	Project Quantitation [3] Limit (mg/kg)	Analytical Method		Achievable Laboratory Limits	
				MDLs[2]	Method QLs (mg/kg)	MDLs[2]	QLs (mg/kg)
*Aluminum	7429-90-5	NA	1.5 – 7.4		40		40
*Antimony	7440-36-0	2[1]	0.3 – 1.0		12		12
*Arsenic	7440-38-2	8.2[1]	0.3 – 1.1		2		2
***Barium**	7440-39-3	5500	0.02 – 0.2		40		40
*Beryllium	7440-41-7	NA	0.02 – 0.2		1		1
***Cadmium**	7440-43-9	1.2[1]	0.04 – 0.2		1		1
*Calcium	7440-70-2	NA	0.5 – 4.0		1000		1000
***Chromium**	7440-47-3	81[1]	0.06 – 0.4		2		2
***Cobalt**	7440-48-4	50[4]	0.06 – 0.4		10		10
***Copper**	7440-50-8	34[1]	0.12 – 1.2		5		5
***Cyanide**	57-12-5	0.9[5]	0.1 - 10		1		1
***Iron**	7439-89-6	20,000[4]	2.2 – 6.4		20		20
***Lead**	7439-92-1	46.7[1]	0.12 – 0.52		0.6		0.6
*Magnesium	7439-95-4	NA	0.54 – 40		1000		1000
*Manganese	7439-96-5	460[4]	0.02 – 0.2		3		3
***Mercury**	7439-97-6	0.15[1]	0.02 – 0.2		0.1		0.1
***Nickel**	7440-02-0	20.9[1]	0.08 – 0.4		8		8
*Potassium	7440-09-7	NA	5.2 – 10		1000		1000
***Selenium**	7782-49-2	70[6]	0.34 – 1.0		1		1
***Silver**	7440-22-4	1[1]	0.04 – 0.6		2		2
*Sodium	7440-23-5	NA	1.3 – 80		1000		1000
*Thallium	7440-28-0	NA	0.5 – 1.6		2		2
*Vanadium	7440-62-2	NA	0.06 – 0.4		10		10
***Zinc**	7440-66-6	150[1]	0.1 – 0.7		4		4

Notes:
NA Not applicable
* Previously detected on site
Bold Text – considered site contaminant, based on possible use in building 32 activities
(1) ERL (Long et.al. 1991, 1995)
(2) MDLs to be determined during laboratory contract procedures
(3) Range of typical IDLs from current subcontract laboratories
(4) LEL (OEME, 1993
(5) EPA Region IV soil Screening Benchmarks
(6) ORNL Soil Invertebrate Benchmarks

Detection limits of the PID or FID instruments vary based on the conditions in which they are operating. The air moisture, temperature and other factors will influence the readings the instruments provide. Because the PID or FID will be used to determine a difference between relative high and low concentrations present, any readable response by these instruments on each sample is adequate. An instrument that does not elicit a response during calibration or testing with a known source will be deemed inadequate for use for this purpose.

4.3 MEASUREMENT AND PERFORMANCE CRITERIA

Two types of QC checks and samples will be utilized for this project. Batch-specific QC will include QC samples that are handled, prepared and analyzed concurrently with the environmental samples. This data will be used to ensure that the procedures used to collect, transport, and analyze a batch of samples was performed properly and under known, well-defined conditions. Examples of batch-specific QC are trip blanks, equipment blanks, laboratory control samples, and calibration checks. Sample-specific QC will be used to evaluate potential sources of error in the collection, transport and analysis of individual samples. Examples of sample-specific QC are matrix spikes and sample duplicates.
The type and frequency of laboratory quality control checks are defined by the methods listed in Table 3-3.

4.3.1 Sampling Quality Control

The following field quality control samples will be collected to monitor the quality of the sampling to be performed. Table 3-2 summarizes the field quality control requirements for soil, sediment and groundwater.

Rinsate Blank: Rinsate blanks or equipment blanks, are obtained under representative field conditions by running analyte-free deionized water through decontaminated sample collection equipment. Equipment rinsate water is collected in appropriate sample containers and preserved as required by the analysis. Rinsate blanks are used to assess the effectiveness of decontamination procedures. Rinsate blanks are required at a rate of one in ten samples, per matrix, or one per sampling event if less than ten samples are collected.

Trip Blanks: Methanol VOC trip blanks are prepared in the laboratory (or in the field, in an area outside the zone of contamination) prior to the sampling event. Trip blanks are packaged and shipped with the field samples. The results obtained from trip blank analysis are used to assess the purity of the methanol and potential cross-contamination during sample transport and storage. These trip blanks will be prepared with the same methanol used for the field samples. Trip blanks are required at the rate of one in ten samples, or one per shipping container, whichever is greater.

Field Duplicates: Field duplicates will be submitted at the rate of one for every ten field samples, per matrix. For soil sampling, field duplicates will be collected by mixing the soil and then dividing it into two containers (with the exception of VOC duplicates, collected prior to mixing). For groundwater sampling, field duplicates are collected by filling one complete set of sample containers for the original sample, and collecting another aliquot for the second (duplicate) sample.

Field duplicates provide precision information regarding homogeneity and distribution of the contaminants.

4.3.2 Analytical Quality Control

The groundwater and soil analyses to be performed under this project will comply with the requirements and quality control procedures specified in the analytical methods.

4.4 SAMPLE IDENTIFICATION AND TRACKING SYSTEM

Samples will be labeled as soon as they are collected. Sample numbers will reflect the source, medium, and location. An alpha numeric identification system described below is required for use at the site so that sample data can be easily assigned and uploaded into the Newport Environmental Georgraphic information System (EGIS), already prepared for Newport IR sites. The sample identification system is described below:

G32	-	AANN	-	NNNNNN
(Site Identifier) -		(Medium) & (Sample Location)	-	(Depth or date)

The site identifier for the Building 32 investigation will be G32. The environmental medium from which the sample is taken is identified by a two or three character identifier as shown below.

soil - SB (subsurface soil) or SS (surface soil)
sediment - SD
groundwater - MW
drainway residue sample – OTS (stands for Other Solids)

This designation is followed by the location number. Monitoring wells will have "S", "M" or "D" indicator for shallow, middle and deep overburden (if applicable) and "B" indicator for bedrock attached to the location number.

Following the sample location identifier, all soil, sediment and other media samples with the exception of groundwater, will be identified with depth, expressed as an interval in feet. Groundwater samples will have a date identification, to differentiate sample collections at the same wells but at different times.

For example, a soil sample collected from 2-4 feet below ground surface from SB01 will be identified as G32- SB01-0204. A groundwater sample collected from the bedrock well MW01B on December 19, 2002 will be identified as G32-MW01B-121902.

Blind duplicate samples will be designated such that the location designation will be replaced with a chronological number:

Duplicates: G32-SD-DUP##

Field blanks will be designated such that they can clearly be identified as field blanks. The field paperwork must be able to identify the source (DIUF or HPLC water), as appropriate.

Field Blanks: G32-FB##

Rinsate blanks will be identified using a blind code for the sample, although the field paperwork must be able to identify the tool that was last used, so possible quality assurance issues can be clearly identified.

Rinsate Blanks: G32-RB##

Trip blanks will be designated so that they can clearly be identified using an identifier (TB) and its chronological number.

Trip Blanks: G32-TB##

Matrix spike samples are simply marked as such on the sample containers and on the chain-of-custody record.

4.5 SAMPLE HANDLING, TRACKING AND CUSTODY REQUIREMENTS

Custody of samples must be maintained and documented at all times. To ensure the integrity of a sample from collection through analysis, an accurate written record is necessary to trace the possession and handling of the sample. This documentation is referred to as the "chain of custody". Chain of custody begins when samples are collected in the field, and is maintained by storing the samples in secure areas until custody can be passed on. All samples will be accompanied by a chain-of-custody form that will describe the sample identifiers, the analytical parameters, and the persons who are responsible for the sample integrity.

Following collection, samples will be placed on ice in a secure cooler and attended by TtNUS personnel or placed in locked vehicles or designated storage areas until analysis or shipment to an off-site laboratory. Chain-of-custody procedures are described in further detail in the following SOPs (presented in Appendix C).

SA-6.3 Field Documentation
SA-6.1 Non-Radiological Sample Handling

Custody of the samples will be maintained at all times and documented in the chain-of-custody forms to ensure the integrity of a sample from collection through analysis. The chain of custody begins at the time the sample is collected. Custody will be maintained by TtNUS prior to sample shipment by ensuring that the sample is in the physical possession or view of an authorized person, or the sample is in a secure area, restricted to authorized personnel only.

The samples will be shipped to the laboratories in coolers packed with ice and vermiculite, or equivalent packing material, to cushion the samples to prevent breakage and to maintain the required temperature for the samples. A container filled with water and labeled "Temperature Blank" will be included in each cooler. The temperature of this blank will be measured by the laboratory upon sample receipt to verify acceptable cooling of samples. The coolers will be taped and sealed with a signed custody seal to ensure the chain of custody is maintained. The chain-of-custody forms are shipped to the laboratory with the samples.

Samples will be shipped to the laboratories by an overnight courier (Federal Express) to ensure that maximum sample holding times are not exceeded. The maximum allowable sample holding times before sample extraction, digestion, or analysis are presented in Table 3-3. This table also lists the sample containers and preservatives used to maintain the integrity of the sample.

Each sample collected will be assigned a unique sampling tracking number, as described in Section 4.4. The sample number, sample collection date and time, person collecting the sample and a list of the analytes that sample is to be analyzed for will be recorded on each container, and also on the chain-of-custody form. The chain-of-custody form is a two-part form, the original accompanies the samples to the analytical laboratory, and the copy is retained by the sampling staff until it is turned over to the data validators.

4.6 DOCUMENTATION OF FIELD ACTIVITIES

The following sections outline the procedures that will be used by field personnel to document project and sample collection activities at the Site. Detailed and accurate documentation is necessary in order to ensure data integrity.

4.6.1 Field Notes

Documentation of field observations will be recorded in a field logbook and/or field sampling log sheets. Field logbooks utilized on this project will consist of bound, water-resistant logbooks. All pages of the logbook will be numbered sequentially and observations will be recorded with indelible ink. Field logbooks will be maintained according to TtNUS SOP No. SA-6.3, Section 5.2 (Appendix C). Field sample log sheets will be used to document sample collection details, while other observations and activities will be recorded in the field logbook. Instrument calibration logs will be used to record the daily instrument calibration.

For sampling and field activities, the following types of information may be recorded:

- Project name
- Date and time of logbook entries
- Personnel
- Weather conditions
- Activities involved with the sampling
- Subcontractor information
- Site observations
- Site sketches
- Visitors
- Health & Safety issues including Personal Protective Equipment (PPE)
- Log of photographs

The following sections outline the information that will be documented in the field according to the media to be sampled and the activities to be performed.

Soil and Sediment Sampling

Sample Log Sheets – Solid Phase forms will be used to document each soil and sediment sample collected. The following information will be recorded:

- Personnel performing the sampling
- Diagram of soil sampling locations
- Date and time of sample collection
- Sample location identification
- Depth interval of sample collection
- Parameters to be analyzed
- Description of sampling procedures
- PID/FID readings
- Description of visual observations of soil or sediment properties (type, color, odors, etc.)
- General observations
- Identification and description of any duplicate samples

Groundwater Sampling

Groundwater Sample Log Sheets will be used to document each groundwater sample collection. The following information will be recorded:

- Personnel performing the sampling
- Date and time of sample collection
- Sample location identification
- Low-Flow well purge data
- Parameters to be analyzed
- Description of sampling procedures
- General observations
- Identification and description of any duplicate samples

Drilling

Boring Log Sheets will be used to document each soil boring including the small diameter borings and borings advanced using drive and wash and bedrock coring methods. The following information will be recorded:

- Drilling subcontractor
- Name of the rig geologist
- Soils/fill/bedrock description using the Unified Soils Classification System
- Depth of water
- General observations
- Blow Counts, sample depths, penetration and recovery lengths
- PID/FID Screening and jar headspace results
- Depth to bedrock, if encountered
- End of boring depth

Well Construction

Well Construction Log Sheets will be used to document each well installation. The following information will be recorded:

- Drilling subcontractor
- Name of the geologist performing oversight of the installation
- Diagram of well installation activities
- Depth of water
- Well construction materials and design
- Well depth and screen intervals
- Depth to bedrock if encountered
- Description of any atypical installation procedures
- General observations

The field logbooks and sample log sheets will remain on site for the duration of the field investigation. After the investigation, all documentation will be stored in the project files.

4.6.2 Field Documentation Management

After the investigation is completed, the field sampling log sheets will be organized by date and media and filed in the project files. The field logbooks for this project will be used only for this Site, and will also be categorized and maintained in the project files after the completion of the field program. Project personnel completing concurrent field sampling activities may maintain multiple field logbooks. When possible, logbooks will be segregated by sampling activity. The field logbooks will be titled based on date and activity.

4.6.3 Calibration Documentation

Field equipment normally requiring calibration will be calibrated and operated in accordance with the manufacturer's instructions and manuals. A log will be kept on site, documenting the periodic calibration results for each field instrument.

Calibration procedures for laboratory equipment used in the analysis of environmental samples will be performed in accordance with NFESC requirements and contract requirements under the Master Agreements, i.e., CLP requirements for Level IV.

4.7 FIXED LABORATORY ANALYTICAL METHOD REQUIREMENTS

This section of the QAPP describes the analytical techniques that will be used by the fixed laboratory to generate definitive data for the project. It documents the fixed laboratory analytical methods and SOPs that will be used to meet measurement performance criteria and achieve project-required quantitation limits for the COCs and other target compounds.

4.7.1 Fixed Laboratory Analytical Methods and SOPs

Contract laboratories, to be solicited at a later date, will perform soil, sediment and groundwater analyses. Analytical methods, instrument maintenance, instrument calibration, quality control samples, and acceptable limits will be specified in the subcontract specifications. However, the laboratories selected will be required to meet the project action limits as described in Section 4.2 of this Work Plan.

4.7.2 Fixed Laboratory Instrument/Equipment Maintenance, Testing, and Inspection Requirements

The specific laboratory equipment maintenance and calibration procedures are set by the laboratories, specific to the equipment used. Generalized procedures likely to be required of these subcontracted laboratories to ensure that the laboratory instruments are available and in working order to meet the required turn-around time of these analyses provided in Table 4-4.

The subcontracted laboratories will check the instruments used for the analyses as described in Table 4-4 of this Work Plan. The instruments shall be monitored on a daily basis for potential failure. The analysis of blanks and control standards at the start and at the end of the day provides real-time information to the analyst on the conditions of the instruments. Records of equipment maintenance logs are maintained for the gas chromatograph, mass spectrometer, ICP, and all instruments used.

The subcontract laboratories will perform instrument/equipment maintenance and inspection as required in the laboratory specifications.

4.7.3 Fixed Laboratory Inspection and Acceptance Requirements for Supplies

All supplies used by the subcontract laboratories will be free of contaminants of concern, other target compounds, and interferences. Method blanks will be performed at the rate specified in each method to ensure that reagents and equipment are free of contamination. The corrective actions specified in the Master Agreements and laboratory specifications will be followed if laboratory contamination is detected.

4.7.4 Screening Data Reduction, Review, and Reporting

Field data will be periodically reviewed by technical lead personnel and the TtNUS PM to ensure that the data collected is well documented, clearly described, and meets a standard appropriate for the investigation and its ultimate use. Review of the jar headspace field screening data will include evaluation and review of the calibration procedures and records, data recording procedures, and field techniques. Proper handling techniques for screening sample collection and analysis are critical: samples must be handled consistently, as the data from each sample will be compared with others from the boring. Quality control procedures that are set up to evaluate comparability in laboratory analysis are not available for screening analysis. Therefore, field audits described elsewhere in this section will be used to evaluate the consistency and appropriateness of the jar headspace screening methods and procedures.

4.8 DATA DOCUMENTATION AND RECORDS MANAGEMENT

This section describes how all project information will be managed, organized, and maintained for efficient use by the project personnel. The information management process is outlined from the point of data generation to ultimate storage.

TABLE 4-4
GENERAL LABORATORY INSTRUMENT MAINTENANCE AND CALIBRATION
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NEWPORT, RHODE ISLAND

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA
GC	Pesticides/ PCBs	• Perform daily check of standards. If the daily check fails, the standard must be checked and re-prepared if needed. If the standard is acceptable, the analytical system must be evaluated. Front end maintenance as described above including septum replacement may be needed. ECDs may require thermal cleaning if a high background signal is indicated. All maintenance on the ECDs beyond thermal cleaning is performed by the manufacturer.	Prior to sample analysis	%RSD $\leq$ 20	Use linear regression per SW-846 or recalibrate	Analyst
GC/MS	VOC SVOC DRO	Instruments are monitored on a daily basis by the bench analyst for any potential failure. The analysis of blanks and control standards at the start of the day and as analysis continues helps to provide real time feedback to the analyst on the condition of the instruments. Routine maintenance for the (1) mass spec, (2) sample introduction system, and (3) GC are presented below.	Prior to sample analysis	%RSD $\leq$ 30% for all "Standard" compounds and %RSD $\leq$ 40% for all "Non-standard" compounds	Correct problem then repeat initial calibration curve	Analyst
ICP	Metals	Clean torch assembly and spray chamber when discolored or when degradation in data quality, clean nebulizer, check argon, replace peristaltic pump tubing.	ICAL – At the beginning of each day or if QC does not meet criteria	90 - 110%	Recalibrate	Analyst/Supervisor
			ICV – Immediately after every ICAL	90 – 110%	Recalibrate or reanalyze affected data	Analyst/Supervisor
			CCV – Every 10 samples or every two hours	90 – 110%	Recalibrate or reanalyze affected data	Analyst//Supervisor

TABLE 4-4 (CONT.)
GENERAL LABORATORY INSTRUMENT MAINTENANCE AND CALIBRATION
WORK PLAN
SITE 17 REMEDIAL INVESTIGATION
NEWPORT, RHODE ISLAND
PAGE 2 OF 2

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA
CVAA	Mercury	Replace peristaltic pump tubing, replace mercury lamp as necessary, clean optical cell, clean liquid/gas separator as needed. Replace peristaltic pump tubing, replace mercury lamp as necessary, clean optical cell, clean liquid/gas separator as needed.	ICAL – At the beginning of each day or if QC does not meet criteria	90 – 110%	Recalibrate	Analyst/Supervisor
			ICV – Immediately after every ICAL	90 – 110%	Recalibrate or reanalyze affected data	Analyst/Supervisor
			CCV – Every 10 samples or every two hours	90 – 110%	Recalibrate or reanalyze affected data	Analyst/Supervisor

1) <u>Mass Spectrometers</u>
- Daily check of vacuum ion gauge (Increase in ion count indicates a potential leak)
- Daily (every 24 hours) autotune check with BFB
- Cleaning of ion source on quarterly basis or as needed
- The oil level and quality is visually checked on a monthly basis to insure proper vacuum pump function, and oil is changed every 6 months.

2) <u>Sample Introduction System</u>
- The mass flow controller used for sample introduction is sent for off-site calibration against a NIST-certifiable source once every two years.
- To ensure a clean sample introduction system, if necessary, the lines and trap are "steam-cleaned" by analyzing a humidified system blank. This takes place every day following standards (i.e., CCV) analysis. Humidified system blanks are also analyzed after saturation-level detections in samples.

3) <u>Gas Chromatograph</u>
Basic maintenance includes the following: (Every 6 months or more frequently if needed)
- Clip 3 feet off the front end of the capillary column, and if necessary, the back end as well.
- Replace the injection port liner. The liner is replaced by removing the inlet cap using a wrench and releasing the liner from the inlet body using a pair of tweezers. Care should be taken not to get finger prints on any inside surface.
- Once per week change septa on the GC and once per day change the septa on the valve syringe interface (injection port). Always use Supelco Thermogreen septa and take care not to leave finger prints on any inside heated surface. Wear a pair of white cotton gloves or use tweezers to handle the septa. Lower the oven temperature to 40° C. Remove the inlet cap with a wrench, remove the old septa with a pair of tweezers and insert the new septa.
- The column is replaced when chromatography peak shape or resolution degrades. Similarly, if the column bleed profile rises with age then the column needs replacing. Use new black graphite ferrules each time and clip off approximately 1" of column after inserting it through the ferrule. This will remove any graphite particles that may have scraped off into t he column. Tighten the column nut and ferrule finger tight and one quarter turn with a wrench. Tightening any more only crushes the ferrule and may damage the column.
- The branch analyst will document any routine or major maintenance in the bound instrument logbook assigned to each instrument. The date of the maintenance, what work was performed and analyst initials are included.

4.8.1 Project Documentation and Records

A summary of Site records and documentation to be generated and stored in the TtNUS project files is provided in Table 4-5.

4.8.2 Field Screening Data Management

The only field screening analyses are PID and/or FID headspace results (and breathing zone readings for safety purposes). The total volatile organics readings provided by the jar headspace analysis will be recorded on the boring logs on which the other boring information is being recorded. The total VOCs will be expressed in ppmv (parts per million by volume) to a detection level determined by the field geologist.

Breathing zone readings for health and safety purposes will be recorded on field sampling sheets, boring logs, or in the field logbooks.

4.8.3 Fixed Laboratory Data Package Deliverables

A turn-around time of 21 days will be requested for all the laboratory analysis. Typical itemized data package deliverables for the laboratory analyses are presented in Table 4-6. Lab electronic deliverables formatted according to the requirements of the laboratory specifications will be provided by the contract laboratories.

4.8.4 Data Reporting Formats

Field data will be recorded in the field log books and field forms. All log book and log sheet entries must be made in indelible ink (black pen is preferred). No erasures or liquid paper/white out are permitted. If an incorrect entry is made, the data will be crossed out with a single strike mark, and initialed and dated. The field personnel will sign and date the log book pages and field forms. Examples of the forms to be used in the field are presented in Appendix D of this Work Plan.

4.8.5 Data Handling and Management

The data handling procedures to be followed by the laboratories will meet the requirements of the subcontracts.

TABLE 4-5
PROJECT DOCUMENTATION AND RECORDS
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Sample Collection And Other Field Records	Fixed Laboratory Records	Data Assessment Records
Field Logbooks	Sample Receipt, Custody and Tracking Records	Field Sampling Audit Check Lists
Sample Log Sheets-Solid Phase	Standards Traceability Logs	Fixed Laboratory Check Lists
Sample Log Sheets-Liquid Phase	Equipment Calibration Logs	Audit Report and Quality Notices
Sample Log Sheets-"Low Flow" Groundwater	Sample Prep Logs	PE Evaluation Scores
Boring Logs	Sample analysis Logs	Data Validation Reports
Well Construction Logs	Equipment Maintenance and Testing Logs	Telephone Logs
Well Development Logs	Corrective Action Forms	
Chain-Of Custody Records	Data Results Forms	
Air Bills	Reported Results for Standards, QC Checks, and QC Samples	
Sample Tags	Instrument Print-outs for Samples and Standards	
Custody Seals	Data Verification Check List	
Telephone Logs	Sample Disposal Records	
Field Modification Records	Telephone Logs	
Field Instrument Calibration Logs		

TABLE 4-6
LABORATORY DATA PACKAGE ELEMENTS
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

DATA PACKAGE ELEMENTS	VOA	SVOC & DRO	Pest/ PCB	Metals & Cyanide	TOC	Alkalinity	Sulfide
♦ **INVENTORY SHEET (Org. and Inorg. DC-2 Form)**	X	X	X	X	X	X	X
♦ **NARRATIVE (Org. Narrative, Inorg. Cover Page)**	X	X	X	X	X	X	X
♦ **EPA SHIPPING/RECEIVING DOCUMENTS AND INTERNAL LABORATORY COC RECORDS:**							
- Airbills	X	X	X	X	X	X	X
- Chain-of-Custody Records/Forms (Traffic Report)	X	X	X	X	X	X	X
- Sample Tags		X	X	X			
- Sample Log-In Sheet (Org. and Inorg. DC-1 Form)	X	X	X	X	X	X	X
- Miscellaneous Shipping/Receiving Records	X	X	X	X	X	X	X
- Internal Lab. Sample Transfer Records and Tracking Sheets	X	X	X	X	X	X	X
♦ **SAMPLE DATA:**							
- Tabulated Summary Form for Field Sample and PE Sample Results (Org. and Inorg. Form I)	X	X	X	X	X	X	X
- Tentatively Identified Compounds Tabulate Summary Form (Org. Form I TIC)	X	X					
- Reconstructed Total Ion Chromatogram (RIC) for each sample	X	X					
- Raw spectra of target compound and background subtracted spectrum of target compound for each sample	X	X					
- Mass spectra of all reported TICs/three best library matches for each sample	X	X					
- Chromatograms from both columns for each sample			X				
- GC Integration report or data system printouts and calibration plots for each sample	X	X	X	X	X	X	X
- Pesticide/PCB Identification Tabulated Summary Form (Org. Form X)			X				
- For Pest/PCB confirmed by GC/MS, copies of raw spectra and background subtracted spectrum of target compounds			X				
- GPC sample chromatograms		X	X				
- Manual worksheets	X	X	X	X	X	X	X
- Sample preparation/extraction/digestion log (Inorg. Form XIII) and logbook pages	X	X	X	X	X	X	X
- Sample analysis run log (Inorg. Form XIV) and logbook pages	X	X	X	X	X	X	X
- ICP Raw Data				X			
- Furnace AA Raw Data							

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TABLE 4-6 (CONT.)
LABORATORY DATA PACKAGE ELEMENTS
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 3

DATA PACKAGE ELEMENTS	VOA	SVOC & DRO	Pest/ PCB	Metals & Cyanide	TOC	Alkalinity	Sulfide
♦ **SAMPLE DATA(continued):**							
- Mercury Raw Data				X			
- Cyanide Raw Data							
- Other Analytical Raw Data	X	X	X	X	X	X	X
♦ **STANDARDS DATA:**							
- Method Detection Limit Study Tabulated Summary Form							
- Initial Calibration Tabulated Summary Form (Org. Form VI, Inorg. Form IIA)	X	X	X	X	X	X	X
- Continuing Calibration Tabulated Summary Form (Org. Form VII, Inorg. Form IIA)	X	X	X	X	X	X	X
- RICs and Quan Reports for all GC/MS standards	X	X					
- Pesticides Analyte Resolution tabulated Summary Form (Org. Form VI, Pest-4)			X				
- Pesticides Calibration Verification Tabulated Summary Form (Org. Form VII, Pest-1 and Pest-2)			X				
- Pesticide Analytical Sequence Tabulated Summary Form (Org. Form VIII-Pest)			X				
- GC Chromatograms and data system printouts for all GC standards			X				
- For Pesticides/Aroclors confirmed by GC/MS, copies of spectra for standards data			X				
- GPC Calibration Tabulated Summary Form (Org. Form IX, Pest-2)		X	X				
- Florisil Cartridge Check Tabulated Summary Form (Org. Form IX, Pest-1)		X	X				
- Instrument Detection Limits Tabulated Summary Form (Inorg. Form X)				X			
- ICP Interelement Correction Factors Tabulated Summary Form (Inorg. Form XIA and XIB)				X			
- ICP Linear Ranges Tabulated Summary Form (Inorg. Form XII)				X			
- CRDL Standards for AA and ICP Tabulated Summary Form (Inorg. Form IIB)				X			
- Standards preparation logbook pages	X	X	X	X	X	X	X
♦ **QC DATA:**							
- Tuning and Mass Calibration Tabulated Summary Form (Org. Form V)	X	X					
- Surrogate Percent Recovery Tabulated Summary Form (Org. Form II)	X	X	X				
- MS/MSD Recovery Tabulated Summary Form (Org. Form III)	X	X	X				

TABLE 4-6 (CONT.)
LABORATORY DATA PACKAGE ELEMENTS
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND
PAGE 3 OF 3

DATA PACKAGE ELEMENTS	VOA	SVOC & DRO	Pest/ PCB	Metals & Cyanide	TOC	Alkalinity	Sulfide
♦ **QC DATA (continued):**							
- Method Blank Tabulated Summary Form (Org. Form IV and Inorg. Form III)	X	X	X	X	X	X	X
- Internal Standard Area and RT Tabulated Summary Form (Org. Form VIII)	X	X					
- QC Raw Data – RICs, Chromatograms, Quan Reports, Integration Reports, Mass Spectra, etc.	X	X	X	X	X	X	X
- Spike Sample Recovery Tabulated Summary Form (Inorg. Form IV)				X			
- Duplicates Tabulated Summary Form (Inorg. Form VI)				X	X		
- Internal Laboratory Control Sample Tabulated Summary Form (Inorg. Form VII)				X	X		
- Continuing Calibration Tabulated Summary Form (Org. Form VII, Inorg. Form IIA)	X	X	X	X	X	X	X
- Standard Addition Results Tabulated Summary Form (Inorg. Form VIII)				X			
- ICP Serial Dilutions Tabulated Summary Form (Inorg. Form IV)				X			
- QC Raw Data – ICP, Furnace, Mercury computer printouts, etc.				X			
- QC sample preparation logbook pages	X	X	X	X	X	X	X
♦ **MISCELLANEOUS DATA:**							
- Original preparation and analysis forms or copies of preparation and analysis logbook pages	X	X	X	X	X	X	X
- Screening records	X	X	X	X	X	X	X
- All instrument output, including strip charts from screening activities	X	X	X	X	X	X	X
- Preparation Logs Raw Data	X	X	X	X	X	X	X
- Percent Solids Determination Log	X	X	X	X	X	X	X
- Other Records (ex. Telephone Communication Log)	X	X	X	X	X	X	X

VOA = volatile organic compounds
SVOC = semivolatile organic compounds
PEST = pesticide organic compounds
PCB = polychlorinated biphenyls
TOC = Total Organic Carbon
( ) = Form Number

4.8.6 Data Tracking and Control

Data Tracking. Data is tracked from its generation to its archiving in the TtNUS project specific files. The TtNUS Project Manager is responsible for tracking the data generated for the project. The Lead Chemist is responsible for tracking the samples collected and shipped to the contract laboratories. In addition, the Lead Chemist receives the data packages and oversees the data validation effort.

Data Storage, Archiving, and Retrieval. The data packages received from the subcontract laboratories are tracked in the data validation log book. After the data is validated, the data packages are entered into the TtNUS Doc-u-log system and archived in secure files.

The field records including field log books, sample logs, chain-of-custody records, and field calibration logs will be submitted by the FOL to be entered into the Doc-u-log system prior to archiving in secure project files. The project files are audited for accuracy and completeness. At the completion of the Navy contract the records are stored by TtNUS.

Data Security. Data security is the responsibility of the Project Manager. The TtNUS project files are restricted to designated personnel only. Records can only be borrowed temporarily from the project file using a sign-out system. The TtNUS Data Manager maintains the electronic data files. Access to the data files is restricted to qualified personnel only. File and data backup procedures are routinely performed.

4.9 VERIFICATION AND VALIDATION PROCEDURES

This section describes the procedures that will be followed to meet the data verification and validation requirements for this project.

4.9.1 Verification

The data verification process for this project includes the maintenance and periodic review of field documentation, including:

- Site Logbooks
- Instrument Calibration Logs
- Chain of Custody Forms
- Field Summary Reports
- Field Modification Records

Field audits and laboratory internal data reviews are important elements of the data verification process. Each of these elements is discussed in detail in Table 4-7.

4.9.2 Validation

TtNUS will validate the analytical data at a Tier II level in accordance with the Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses. The laboratory data results for alkalinity, sulfide, and total organic carbon analyses will be validated at a Tier I level in accordance with the Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses.

The steps to be followed by TtNUS in the data validation process are as follows:

1. The FOL gives a copy of the chain-of-custody forms to the Lead Chemist. The Lead Chemist forwards a copy to a data entry person.

2. A Database Specialist creates a Microsoft Access (or equivalent) database for the project.

3. The data entry person inputs the information from the chain-of-custody records including the TtNUS sample location, CLP or DAS sample number (traffic report number), date sampled, matrix, and QC type (e.g. blank, duplicate) into the database.

4. The Lead Chemist receives the data packages and electronic data deliverables from the subcontract laboratories. The data packages are logged into the Data Validation Tracking Log.

5. The Lead Chemist assigns a data validator for each data package and transfers the hard copy data packages.

6. The Lead Chemist gives the electronic data deliverables (EDD) to the database specialist.

TABLE 4-7
VERIFICATION TASKS AND PROCEDURES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Verification Task	Description	I – INTERNAL E - EXTERNAL	Responsible for Verification (Name, Organization)
Site Logbook	The site logbook is a hardbound, paginated, controlled-distribution record book. Entries are made for every day that onsite activities take place. Upon completion of the fieldwork, the site logbook becomes part of the project's central file. All logbook, notebook, and log sheet entries are made in indelible ink. No erasures are permitted. If an incorrect entry is made, the data is crossed out with a single strike mark, and initialed and dated. At the completion of entries by any individual, the logbook pages used are signed and dated. The Field Operations Leader signs the site logbook at the end of each day.	I	Field Operations Leader, TtNUS
Instrument Calibration Log	Field team members calibrate or check the calibration of monitoring instruments in accordance with the SOPs. The field team member completes a calibration logsheet, initials it, and dates it. Equipment, which does not calibrate properly, is taken out of service. The FOL collects and submits the calibration logsheets to the project file.	I	Field Team Members, TtNUS
Chain-of-Custody Form	The FOL designates one field team member as shipment coordinator. The shipment coordinator organizes the samples into Sample Delivery Groups by matrix, analysis, and destination and fills out the C-O-C and airbill for each SDG. The samplers sign the C-O-C. The shipping coordinator assigns each SDG to a field team member for packing in coolers. The packer checks each cooler's contents against the C-O-C before sealing it. The original C-O-C is shipped with the samples. The FOL provides a copy of the C-O-C to the Data Validators and submits a copy to the project file. The Data Validators use the C-O-C to track the progress of the shipment.	I	Field Team Members, TtNUS
Field Summary Report	The FOL sends Field Summary Reports to the TtNUS Project Manager to document field activities. The Project Manager submits the reports to the project file and sends a copy of each month's reports to the file, and to the Navy RPM if requested.	I	Field Operations Leader, TtNUS
Field Modification Record	Changes in field operating procedures may be necessary as a result of changed field conditions or unanticipated events. If a substantial change is required, the FOL or designee notifies the TtNUS Project Manager of the need for the change. If necessary, the Project Manager will discuss the change with pertinent individuals, e.g., the Navy RPM, and will provide verbal approval or denial to the FOL or assistant FOL for the proposed change. The FOL will document the change on a Field Modification Record form and forward the form to the TtNUS Project Manager at the earliest convenient time. The Project Manager will sign the form and distribute copies to the TtNUS Program Manager, Navy RPM, and others as needed. A copy of the completed Field Modification Record form will also be attached to the field copy of the work plan.	I	Field Operations Leader, TtNUS

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TABLE 4-7 (CONT'D)
VERIFICATION TASKS AND PROCEDURES
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 2

Verification Task	Description	I – INTERNAL E - EXTERNAL	Responsible for Verification (Name, Organization)
Field Audit	The Quality Assurance Manager or designated representative audits fieldwork according to audit checklists or audit guides. The QA Manager immediately informs the FOL and Project Manager of any findings that require immediate corrective action. The audits verify adherence to the QAPP and all applicable SOPs. The QA Manager records each finding of nonconformance on a Quality Notice report and submits it to the Project Manager. The QA Manager prepares an audit report summarizing the findings, which is distributed to the CLEAN Program Manager, the Project Manager, the FOL, and the Program and Project QA/QC files.	I	Quality Assurance Officer, TtNUS
Laboratory Internal Data Review	There are five categories of review performed in the laboratory: 1. Analytical review performed by the bench chemist. It includes a review of raw data, verification of all method- and project-specific QC requirements, the addition of data qualifier flags when needed, and documentation of any unusual circumstances. 2. Technical review performed by team leader or QA-approved peer. 3. QA review performed by a quality assurance specialist emphasizing overall quality of the data. 4. Data report review by the Reporting Manager, Team Leader, or approved peer to ensure the accuracy of the final report. 5. Electronic deliverable review to ensure the accuracy of the final electronic report.	I	Contracted Laboratory Manager or designee
Laboratory Internal Data Review	All data packages are verified internally by the laboratory according to the applicable laboratory master agreement and or TtNUS technical specifications. The laboratory completes DC-2 forms documenting the organization and completeness of each data package.	I	Laboratory Manager or designee

7. The database specialist uploads the EDD into the project database using a TtNUS-developed file conversion program. The program identifies some common EDD problems (e.g., missing or incorrect SDG number, parameter naming issues) and provides an interface for their resolution. In some cases, queries are run against the EDD to find and fix minor errors. If the errors are serious, e.g. any error affecting the numerical results, the database specialist contacts the laboratory and requests a revised EDD. The upload program checks to see if the incoming data has a corresponding sample number in the database from the chain-of-custody forms. If not, the incoming data is prevented from uploading. The upload program sequesters laboratory QC sample results in a separate table.

8. The database specialist prints a draft data validation table in Microsoft Excel format for distribution to the data validator.

9. The data validator checks the draft data validation tables against the data results (Form I's) in the data package and against the chain-of-custody records to ensure that the database matches the data package. The data validator notifies the database specialist immediately of any major problems (e.g., missing samples). In some cases, the database specialist may ask the laboratory to revise and resubmit the EDD.

10. The data validator performs the Tier I or Tier II validation, assessing potential data quality/usability issues, data completeness and writes the data validation report. The data validator marks up the draft data validation table and submits the complete data report to the Lead Chemist for review.

11. The Lead Chemist reviews the documents and returns them to the data validator for revision.

12. The data validator revises the documents and gives the marked-up draft data validation table to the database specialist.

13. The database specialist (or data entry person) revises the database and prints a final data validation table. The database specialist gives the final data validation table to the data validator along with the marked-up draft data validation table.

14. The data validator compares the final data validation table to the marked-up draft data validation table to make sure that all changes were incorporated into the database. The data validator assembles the data validation reports for approval and submits them for copying and distribution.

4.10 QA MANAGEMENT REPORTS

This section presents the activities that will be performed to keep management updated on the project status. Open communication pathways will benefit the project, by allowing all appropriate personnel to be aware of activities and have the ability to provide input in a timely manner. Input from these parties will be used to make necessary corrective actions to ensure project quality objectives are met.

4.10.1 Report Documentation

The information to be included in each of the QA Management Reports listed in Table 4-8 is summarized as follows.

Verbal Status Reports

The Lead Chemist, FOL, and project personnel will give verbal status reports to the Project Manager on a daily basis or more frequently if needed. The status reports will include the field activities completed for the day, the personnel who completed each activity, the anticipated activities to be completed during the next day, and any issues or problems identified.

Project Status Reports

Project Status Reports will be submitted by the FOL to the TtNUS Project Manager on a weekly basis. The project status reports will include daily site activities performed, any unexpected site conditions, problem resolutions, and corrective actions or violations of this Work Plan that have been discovered or addressed. Any findings that require input from Navy will be communicated promptly to the RPM.

Field Audit Report

Quality assurance audits will be performed by the Quality Assurance Officer (QAO) or QA Representative during field investigations. The audits will include checks on adherence to the QAPP and all applicable SOPs. The QAO will then prepare an audit report summarizing the findings. Nonconformance Quality Notices will be issued to document each observation, deficiency, or concern discovered during the audit. This report is distributed to the CLEAN Program Manager, the Project Manager, the FOL, and the Program and Project QA/QC files. Any findings that require immediate corrective action will be communicated immediately to the FOL and to the Project Manager.

TABLE 4-8
QA MANAGEMENT REPORTS
REMEDIAL INVESTIGATION WORK PLAN
SITE 17, GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Type of Report	Frequency	Project Delivery Date	Person Responsible for Report Preparation	Report Recipients
Verbal Status Reports	Daily during field activities	At the end of every day of field activities or as needed	TtNUS Field personnel TtNUS FOL: L. Seydewitz TtNUS Lead Chemist: Kelly Johnson-Carper	TtNUS PM: S. Parker
Project Status Reports	Weekly during field activities	At the end of each week of field activities	TtNUS FOL: L. Seydewitz	TtNUS PM: S. Parker Program Manager: J. Trepanowski Navy RPM, as requested
Field Audit Reports	At discretion of QA Officer during field activities	10 days after audit	TtNUS QA Officer	TtNUS PM: S. Parker Program Manager: J. Trepanowski
Data Validation Reports	One per data package	3 weeks after date received	Data Validators	Project File Data Management Group TtNUS PM: S. Parker

Data Validation Reports

Tier I and Tier II data validation reports will be developed for this project. Tier I validation will be conducted for alkalinity, sulfide and TOC results. Tier II validation will be performed for the VOCs, SVOCs, pesticides, PCBs, DRO, cyanide and metals results. The data validation reports will be distributed to the TtNUS Project Manager, TtNUS Lead Chemist, and project file.

4.10.2 Assessments and Response Actions

Assessment activities ensure that the resultant data quality is adequate for its intended use and that appropriate corrective actions are implemented to address non-conformances and deviations from the Work Plan. The assessments planned for this project are discussed below.

Field Audit

The TtNUS Project Manager will be responsible for this field investigation. The Project Manager will communicate daily with the Field Operation Leader. In addition, senior geologists, hydrogeologists, and environmental engineers will technically oversee the field tasks. The Project Manager will keep the Navy RPM up to date on the field activities and the progress of the investigation.

Quality assurance audits will be performed by the QAO or QA Representative during field investigations. The audits will include checks on adherence to the Work Plan and all applicable SOPs. The QAO will prepare audit checklists or audit guides. The depth and scope of the audit will be determined and incorporated into the checklist or guidelines. As a minimum, the audit will cover the following items:

- Adherence to sample collection as detailed in the Work Plan and SOPs
- Chain of custody
- Documentation of field activities consistent with the Work Plan and SOPs
- Equipment maintenance and calibration
- Training requirements for site workers

Assessment Findings and Corrective Action Responses

Assessment findings that require corrective action initiate a sequence of events that include documentation of deficiencies, notification of findings, request for corrective action, implementation of corrective action, and follow-up assessment of the corrective action effectiveness. Table 4-9 describes which individuals will be responsible for deviations and project deficiencies, which are identified through the planned project assessments.

Additional Work Plan Non-conformances

Deviations from the Work Plan noted by project personnel outside of the formal assessment process will be documented and resolved using the procedures and personnel that were detailed for the planned assessments.

TABLE 4-9
PROJECT ASSESSMENT
WORK PLAN FOR REMEDIAL INVESTIGATION
SITE 17 GOULD ISLAND
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) responsible for performing assessment, title and organizational affiliation	Person(s) responsible for responding to assessment findings, title and organizational affiliation	Person(s) responsible for identifying and implementing corrective actions (CA), title and organizational affiliation	Person(s) responsible for monitoring effectiveness of CA, title and organizational affiliation
Project Oversight	Continuously	I	TtNUS	TtNUS PM: S. Parker	TtNUS Field Personnel	TtNUS Field Personnel	TtNUS CLEAN Program Manager: J. Trepanowski
Field Audit	Once during field activities	I	TtNUS	TtNUS QAO: Paul Frank	TtNUS PM: S. Parker	TtNUS FOL: L. Seydewitz	TtNUS QAO: Paul Frank
Lab Blank Samples	Periodic	I	Subcontract Laboratory	Laboratory Manager	Laboratory Manager	TtNUS Data Validator	TtNUS Data Validator

5.0 REPORTING

Following the completion of the field sampling and analytical work described in Sections 3 and 4 of this Work Plan, the results will be described in the form of a Remedial Investigation (RI) report. The RI report will contain seven major sections in accordance with EPA Guidance for RI/FS, including background, nature and extent of contamination, fate and transport of contaminants, and the human health and ecological risk assessments. Information to be included in these RI report sections is discussed in the subsections below.

5.1 BACKGROUND AND FINDINGS OF THE INVESTIGATIONS

Section 1.0 of the RI report will describe the history of the Site and the purpose of the report. The Site background sections will include information from the previous studies conducted in the vicinity of Building 32. Additional background information discovered during this investigation and activities at the Site since the publication of the previous investigations will be described in detail and incorporated into the Site background section.

Section 2.0 will describe the investigations that are the focus of this Work Plan. Specifically, this section will be based on Section 3.0 of the Work Plan and on any modifications to the field work, if applicable, during the period of activity.

Section 3.0 will describe the physical characteristics of the study area as they exist at the time of the investigation. This description will address the major surface features (buildings, pipelines, roadways, fences, etc). The subsurface features, including the geology, hydrogeology, soil types, soil depths, and discharge pipelines, will be described as determined by field work explorations. The cultural and ecological settings of the Site will be summarized in this section, with an expanded and more detailed ecological characterization presented in Section 7.0. Offshore features, including discharge outfall locations and bottom sediment descriptions in the study area, will be characterized. Figures will be prepared depicting aerial and/or cross-sectional views of Site features, including geology, maximum and minimum water table elevations, depth to bedrock, ecological setting, and sample locations.

Section 4.0 will describe the nature and extent of the contaminants found during this and previous investigations. The conceptual site model presented in Section 2 of this Work Plan will be expanded to describe how the findings of the RI resolve any of the as yet unknown contaminant sources and types. Additional source areas identified will be added, and/or some of those originally targeted may be eliminated. All the chemical analytical data generated from the field work will be presented in this section. Primary site contaminants will be identified based on frequency of detection and concentrations found.

Summary data tables will be included in Section 4.0 of the RI report for all of the matrices sampled. In these tables, the contaminant concentrations that exceed documented regional background conditions, site-specific reference sample concentrations, and regulatory standards will be identified, as appropriate. Pertinent information such as contaminant concentrations and sample locations will be included in Section 4.0 figures.

Section 5.0 will describe the expected fate and transport mechanisms available to the primary site contaminants. The focus of the discussion will likely be the discharge and leachability of metal contamination and degreasing contaminants associated with the operations at Building 32. Other contaminants detected will have similar evaluations performed. The direct discharge of the contaminants through the drainage system, as well as the possibility of transport of these contaminants to groundwater (from leaks, discharges, or spills) and subsequently into off-shore waters and sediments will be discussed. An evaluation of the contaminants' propensity to bioaccumulate, their persistence, and their mobility in the different media present at the Site, will be included. In addition, other relevant contaminant migration pathways identified for organic compounds will be discussed if they are identified.

The conceptual site model will be updated in Section 5 as well, showing how the contaminants detected will be available to receptors through available transport mechanisms, degradation and dilution, as well as accumulation and biomagnification.

5.2 HUMAN HEALTH RISK ASSESSMENT

Section 6.0 of the RI report will consist of a human health risk assessment. This risk assessment will be prepared in accordance with Navy and EPA guidance documents for evaluation of risk at Superfund sites. The risk assessment will include data evaluation through risk-based screening steps, toxicity assessment, exposure assessment, and risk characterization steps, and a discussion of uncertainty.

The chemicals detected at the Site will be grouped by media for screening against applicable criteria. All media sampled will be screened in the human health risk assessment. However, some media may not be suitable for screening against all possible criteria. For instance, deep subsurface soils may not be screened against residential criteria, and off-shore sediments may not be screened against industrial or residential criteria as the exposure scenarios limit expected interaction with these media. Applicable risk-based criteria (RBCs) will include EPA Region IX preliminary remediation goals (PRGs) and/or any designated Region I industrial RBCs, as well as applicable RIDEM direct exposure criteria for media sampled at the Site. The RBCs will be set at a level of 1E-06 for carcinogens and 0.1 for noncarcinogens. A chemical will be eliminated as a contaminant of potential concern (COPC) for the media if the maximum detected concentration for the chemical is less than applicable screening criteria. Additionally, chemical data will be screened against documented regional background conditions and site specific reference samples. Some analytical data will be eliminated from site specific risk calculation if it is appropriate, based on these comparisons.

Chemicals that lack toxicity values will be evaluated qualitatively in the risk assessment. A qualitative evaluation will include a discussion of the presence of the chemical at the specific sample stations where it was detected, a discussion of the toxicity of similar chemicals found at these stations or elsewhere at the Site (if applicable), and an opinion of the impact of this chemical on the risk assessment results (i.e. will the omission of this chemical from the risk assessment be significant or not).

Chemicals that are breakdown products of selected COPCs or chemicals that are in the same family as selected COPCs (carcinogenic PAHs) will also be included as COPCs. The final list of COPCs will be carried forward for toxicity assessment and risk characterization.

Statistical analysis will be performed on the data to determine reasonable maximum and average exposure concentrations for identification of COPCs. These exposure point concentrations will then be used in subsequent quantitative risk calculations.

The site conceptual model will be evaluated using the exposure point concentrations (EPCs) and information used for the model development to determine if a completed exposure pathway may exist for receptors present. In accordance with Navy policy, the risk assessment must first demonstrate that a contaminant is present above a risk-based concentration, and that there is a possibility for receptor exposure, prior to conducting the subsequent steps of the quantified human health risk assessment.

The Toxicity Assessment will present available reference doses (RfDs), cancer slope factors (CSFs), EPA weights of evidence, response parameter adjustments, and any other relevant information pertaining to COPCs selected in data evaluation. Quantitative toxicity indices, where available, will be presented in this section. Additionally, a toxicological profile will be developed for each COPC.

A quantified exposure assessment will be prepared to identify potential exposures to receptors. Exposure scenarios will be used for the recreational and trespassing receptors using basic scenarios. Current and future exposures will be evaluated using these scenarios.

- Current Trespasser (adolescent and adult) - A trespasser is an adult or adolescent assumed to trespass at the Site at a stated frequency in days per year. Typically, 45 days per year is used, although at this Site, fewer days are likely to be more realistic, considering the remoteness of the island and the restricted nature of the Site. Trespassing receptors can possibly be exposed to COPCs in surface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust and to COPCs in sediment through incidental ingestion and dermal contact.

- Future Recreational Receptor - The recreational receptor can be an adult, child, or adolescent using the Site for passive recreation, including walking, hiking, picnicking, hunting, or fishing. Recreational exposures are based on a given frequency of visitation in days per year. For a remote location such as this, a low frequency such as 7 days per year is appropriate. Recreational exposures can occur through ingestion, dermal contact, and inhalation of COPCs in surface soil and ingestion and dermal contact of COPCs in sediment.

- Future Industrial Worker - The industrial worker will be an adult, working at the Site for a period of 25 years at a frequency of 250 days per year. This person can have limited contact with surface and subsurface soil only through incidental ingestion, dermal contact, and inhalation of fugitive dust.

- Future Construction Worker - The construction worker receptor will be an adult, working at the Site for a limited period of time (one year) on a frequency of 130 days per year (one half of the available working time in a year). This receptor can be exposed to surface soil, subsurface soil and (if it is available) groundwater through ingestion, dermal contact, and inhalation of COPCs.

The risk characterization will present the approaches and results of the estimation of carcinogenic and noncarcinogenic risks. The risk characterization will evaluate the potential for adverse health effects from exposure to COPC concentrations in site media by integrating information developed during the toxicity and exposure assessments. Applicable receptor risks will be presented in a tabular format, with accompanying text to interpret the results of the estimation of risks from selected COPCs. Finally, discussion of uncertainties related to risk assessment will be presented.

The risk assessment will be prepared in accordance with current U.S. EPA and Navy guidance. This guidance is contained in various documents that include, but are not limited to, the following:

- "Region IX Preliminary Remediation Goals Table," USEPA, Region IX, November 2002.

- "Integrated Risk Information System (IRIS)," Computer Database, EPA, Washington, D.C., 2003.

- Health Effects Assessment Summary Tables (HEAST), Update FY 1997, EPA 540-R-97-036, prepared by International Consultants Inc. for the National Center for Environmental Assessment, USEPA Cincinati, Ohio.

- Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Peer review draft March 2001, OSWER 9355.4-24 Office of Emergency and Remedial Response, USEPA.

- Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual (Part A). December 1989. EPA/540/1-89/002.

- Risk Assessment Guidance for Superfund Volume I - Human Health Evaluation Manual - Supplemental Guidance - "Standard Default Exposure Factors". March 25, 1991. OSWER Directive 9285.6-03.

- Final Guidance for Data Usability in Risk Assessment (Parts A and B), OSWER Directive92857-09A and 09B, 1992.

- EPA Guidance for Data Assessment 1997. EPA/600/R-96/084.

- Supplemental Guidance to RAGS: Calculating the Concentration Term. May 1992. OSWER Publication 9285.7-08I.

- Exposure Factors Handbook: 1997
  - Volume 1. EPA/600/P-95/002Fa
  - Volume 2. EPA/600/P-95/002Fb
  - Volume 3. EPA/600/P-95/002Fc

- Risk Assessment Guidance for Superfund (RAGs) - Volume I - Human Health Evaluation Manual (Part E) - Supplemental Guidance for Dermal Risk Assessment. Interim. September 2001, EPA/540/R/99/005.

- Soil Screening Guidance Technical Background Document. USEPA 1996 EPA/540/R-95/128.

- Region I Supplemental Risk Assessment Guidance for the Superfund Program. June 1989. EPA/901/5-89/001.

- USEPA Region I Risk Updates:
  - No. 2, August 1994
  - No. 3, August 1995
  - No. 4, November 1996
  - No. 5, September 1999

- USEPA, Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual Part D December 2001.

5.3 ECOLOGICAL RISK ASSESSMENT

Section 7.0 of the RI report will include the Tier 1 ecological risk assessment. The ecological risk assessment will follow the Navy Ecological Risk Assessment Tiered Approach, and the U.S. EPA guidance document Ecological Risk Assessment Guidance for SUPERFUND, Process for Designing and Conducting Ecological Risk Assessments, Interim Final, dated June 7, 1997, as amended. The following summarizes the approach to be employed.

The first tier of the ecological risk assessment is performed to identify pathways and compare exposure point concentrations to benchmarks. The updated conceptual site model will be evaluated to determine potential for exposure to ecological receptors. Site-specific contaminants that are thought to be interacting with the receptors will be evaluated to identify concentrations that are likely to cause toxic or other effects to the receptors that are or may be present.

STEP 1: Screening-Level Problem Formulation and Ecological Effects Evaluation

The conceptual model for the Site will be further developed to addresses five issues: the environmental setting and contaminants at the Site; contaminant fate and transport mechanisms; the mechanisms of ecotoxicity and potential receptors; complete exposure pathway evaluation; and selection of endpoints to screen for ecological risk. A thorough compilation and evaluation of the environmental setting, chemical contamination onsite, and contaminant pathways will be performed. The environmental checklist presented in *Representative Sampling Guidance Document, Volume 3: Ecological* (U.S. EPA, 1997; Appendix B) will be used and a Site visit will be conducted, as described in Section 3.2.4 of this Work Plan. Complete potential exposure pathways will be identified for all organisms where contaminants could travel from the source to ecological receptors and be taken up via one or more exposure routes.

As described in Section 2.0 of this Work Plan, the Site is an abandoned industrial facility. During an initial Site walkover, a shrub/scrub habitat with opportunistic vegetation was observed encroaching on the deteriorating building and concrete surfaces. Similarly, opportunistic animal species, such as gulls, pigeons, and rodents, are suspected to use the Site for feeding and nesting.

A detailed ecological characterization of the Site described in Section 3.0 of this Work Plan will serve to identify the potential ecological receptors associated with the Site. If such receptors exist or are potentially present at the Site and/or the surrounding area, the ecological assessment will ascertain if viable exposure scenarios exist by which site-related contaminants may pose a risk to ecological receptors.

A preliminary ecological effects evaluation and the establishment of contaminant exposure levels that represent conservative thresholds for adverse ecological effects will be performed. The conservative thresholds, also called screening ecotoxicity values, will be developed for each complete exposure pathway and contaminant.

Information to be considered for the ecological assessment of the on-shore environment associated with the Site will include on-shore ecological characterization of the Site (see Section 3.0 of this Work Plan); analytical data for surface soils (depth range: 0-2 feet) and marine sediments (depth range 0-12 inches); literature review of detected site-related contaminants (fate, transport, and ecotoxicological characteristics) and identification of available ecological screening benchmarks; and literature review of potential ecological receptors (habitats, natural history, and distribution). Screening benchmarks for soil will be selected from appropriate literature review sources (e.g. for water pathways - ambient water quality criteria (AWQC); for sediment pathways - EPA criteria and National Oceanic and Atmospheric Administration (NOAA) values; and for soil pathways - the EPA Ecotoxicity Database, the Oak Ridge National Laboratory toxicology benchmark documents, and US FWS synoptic review documents. Site-related contaminants for which appropriate screening benchmarks cannot be identified will be discussed qualitatively in the ecological assessment. Soil and sediment data will also be compared to documented regional background conditions for these media. This effort will be conducted to assist the evaluation of site-specific risk, as opposed to risk provided by regional, ubiquitous contaminants.

STEP 2: Screening-Level Exposure Estimate and Risk Quotients

The risk will be estimated by comparing maximum documented exposure concentrations with the ecotoxicity screening values from Step 1. At the conclusion of Step 2, the exposure pathways and preliminary contaminants of concern will have been identified and could be used for performing a baseline risk assessment.

On-site contamination levels and general information on the types of receptors that might be exposed will be used to estimate exposures for the screening-level ecological risk calculation. The parameters that will be used to estimate exposures include: area-use factor, bioavailability, life stage, body weight and food ingestion rates, bioaccumulation, and dietary composition. Parameters where site-specific information is lacking or difficult to develop, conservative assumptions supported by published values or other literature will be used. For estimated exposures, an uncertainty assessment will be determined using professional judgment, and stated where applicable.

A screening-level risk hazard quotient (HQ) will be determined using the exposure estimates and the screening ecotoxicity values developed as part of the previous steps. The HQ approach, which compares point estimates of screening ecotoxicity values and exposure values risk calculation, will be used to estimate risk. Therefore, for each contaminant and environmental medium, the HQ will be expressed as the ratio of a potential exposure level to the applicable criteria. A HQ of less than one (unity) indicates that the contaminant alone is unlikely to cause adverse ecological effects. If multiple contaminants of potential ecological concern exist at the Site, the HQ will be summed for receptors that could be simultaneously exposed to the contaminants that produce effects by the same toxic mechanism. The sum of the HQ is called a hazard index (HI) and an HI of less than one indicates that the group of contaminants is unlikely to cause adverse ecological effects.

The screening-level risk calculation is a conservative estimate to ensure that potential ecological threats are not overlooked. At the end of this step, one of the following possible decisions will be made: either there is adequate information to conclude that ecological risks are negligible, and therefore no quantifiable ecological risk exists; or, there may be quantifiable ecological risk, and additional evaluations are required.

Those contaminants that are found in the environmental media at the Site that have been identified as likely to provide an adverse effect on (risk to) the receptors will undergo a second evaluation of the exposure assumptions that are used in the comparison. For instance, a presumption that contaminant concentrations in porewater are the same as those contaminant concentrations that were measured in groundwater will be evaluated more carefully to determine what the actual porewater concentration might be from dilution at the exposure point. If the second evaluation of the exposure assumptions supports the presumption of exposure to contaminants, the second tier of the ecological risk assessment will be conducted.

The second tier includes the ecological problem formulation, which is an extension of the conceptual site model, a toxicity evaluation, identification and testing of assessment endpoints, and determination of risk based on known cause-and-effect relationships. The performance of the ecological risk assessment is an exceedingly complex undertaking, particularly in a coastal environment that includes terrestrial, intertidal and subtidal environments. The assessment will involve development of evaluation procedures for assessment endpoints (i.e. toxicity tests, growth tests, colonization tests, diversity studies, etc.) specific to the contaminants present, the receptors to be evaluated, and the mechanisms by which the exposure would occur. It is appropriate to design and execute such risk assessment processes specific to the conditions of the problem formulation and conceptual site model, after they are completely developed. Therefore, this Work Plan does not cover the details of a quantified ecological risk assessment. If the first tier assessment identifies the necessity for a quantified ecological risk assessment, a supporting, Work Plan will be developed to design additional sampling and toxicity evaluations to support that risk assessment.

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FIGURE 2-3
PHOTOS OF EAST SHORE, GOULD ISLAND
MARCH 1997

SHORELINE EAST OF BUILDING 32
AT LOCATION OF FORMER ELECTROPLATING ROOM DRAIN OUTFALL
(VIEW IS TO THE NORTH)

EAST SHORELINE SOUTH EAST OF BUILDING 32
SHOWING BEDROCK OUTCROPS AND STONY BEACH IN PREVIOUS FILL AREA
(VIEW IS TO THE SOUTH)

APPENDIX A

DRAFT BACKGROUND SUMMARY REPORT
SITE 17, BUILDING 32, GOULD ISLAND
TtNUS, NOVEMBER 2002

Background Summary Report

for

Site 17
Building 32, Gould Island

Naval Station Newport
Newport, Rhode Island

Environmental Field Activity Northeast
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888
Contract Task Order 0842

November 2002

W5202276D

BACKGROUND SUMMARY REPORT

FOR

SITE 17
BUILDING 32, GOULD ISLAND

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Environmental Field Activity Northeast
Environmental Branch Code EV2
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Submitted by:
Tetra Tech NUS, Inc.
600 Clark Avenue, Suite 3
King of Prussia, Pennsylvania 19406-1433

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0842

November 2002

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1.0 INTRODUCTION

This document was prepared under the Comprehensive Long Term Environmental Action Navy (CLEAN) Contract No. N62467-94-D-0888, Contract Task Order (CTO) 842. The statement of work requires Tetra Tech NUS, Inc. (TtNUS) to perform a Background Report for Study Area 17, which consists of the Building 32 area on Gould Island, which is part of Jamestown, Rhode Island.

Gould Island is located in the East Passage of Narragansett Bay in Rhode Island, approximately 1.5 miles from the Naval Station Newport (NSN) shoreline. Gould Island is located between Aquidneck and Conanicut Islands, and occupies approximately 52 acres (Figure 1-1). Building 32, located on the northeast end of Gould Island, served as a torpedo overhaul shop that has been inactive since the 1950's (Figure 1-2). The electroplating shop, consisting of three rooms located within Building 32 was initially identified as a Study Area (SA 17) in the Federal Facilities Agreement (FFA). Evaluation of data collected in April 2000 resulted in agreement that the SA should be considered a "site" as defined in the FFA and that the site be inclusive of Building 32 and the area surrounding it.

This background memorandum has been prepared to summarize the many activities and data collected at Building 32 and surrounding areas that may be pertinent to the development of a remedial investigation work plan for the site. Several investigation work plans have previously been prepared for the site, however, extensive removal actions, investigations and building demolitions have occurred in recent years, and much of the background information in those work plans has become dated. This background report includes a summary of historical and recent activities conducted and the data collected so that the remedial investigation can be planned without duplication of previous sampling and data collection efforts.

The following major efforts have been summarized for this Background Report:

Tank Closures:

- An underground storage tank (UST) closure and follow-up monitoring was conducted at the former Building 44, located to the north of Building 32. This included two 5,000-gallon steel tanks and five 50,000-gallon concrete tanks. Records show that three concrete tanks stored No. 5 fuel oil, two stored No. 2 fuel oil, while one of the 5,000-gallon steel USTs stored No. 2 fuel oil and the other stored alcohol.

- A UST closure was conducted in July 1997 on a 1,000-gallon UST on the south side of Building 32. This UST reportedly contained No. 2 fuel oil.

BASE MAP IS A PORTION OF THE FOLLOWING 7.5 X 15 MINUTE U.S.G.S. QUADRANGLE:
PRUDENCE ISLAND, RHODE ISLAND, 1955, PHOTOREVISED 1970 AND 1975

GRAPHIC SCALE
0 0.5 MILE 1 MILE

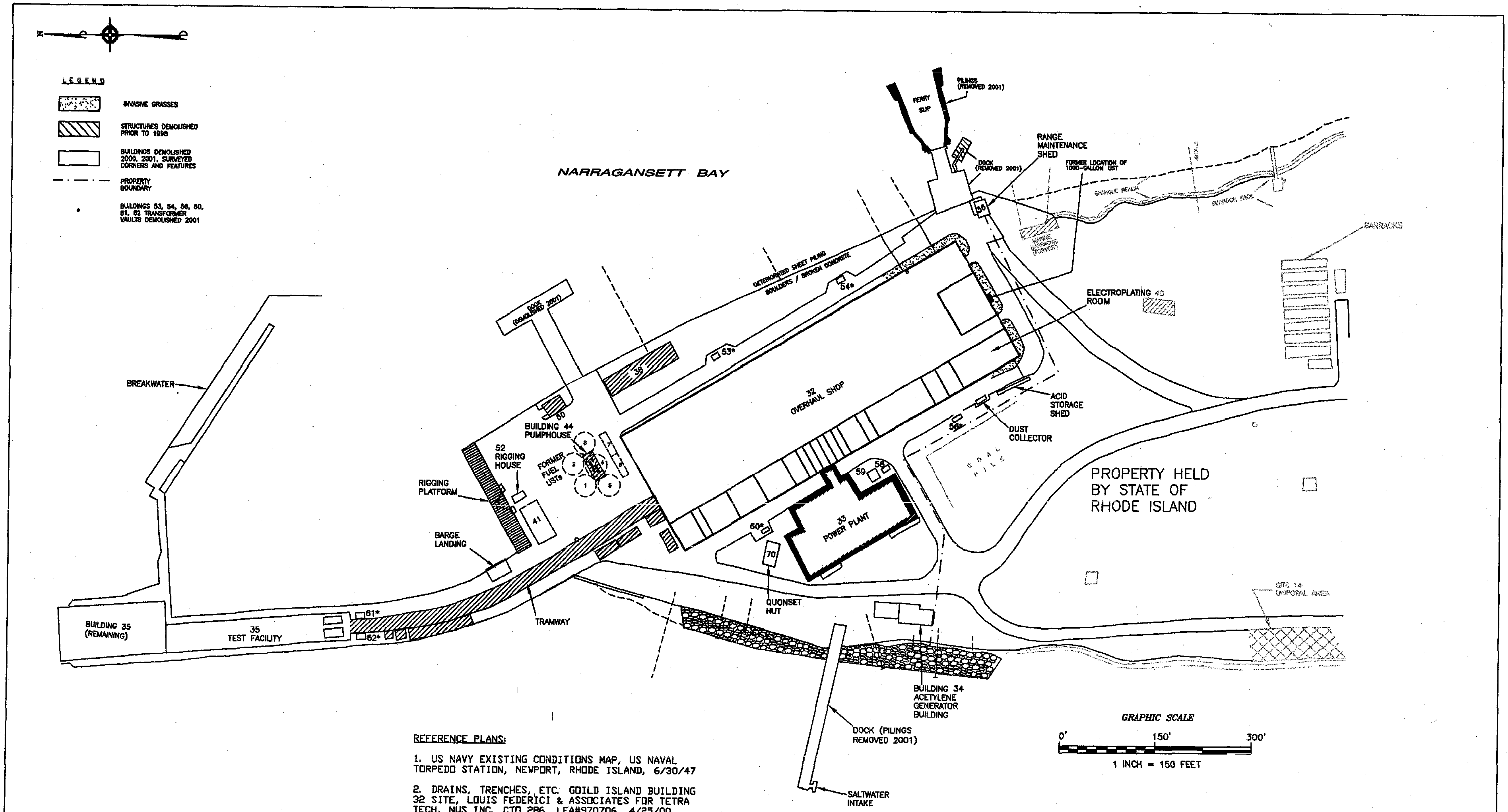
QUADRANGLE LOCATION

SITE LOCUS			
BUILDING 32, GOULD ISLAND			
NAVSTA NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	S. PARKER	DATE:	OCTOBER 7, 2002
SCALE:	AS NOTED	ACAD NAME:	DWG\5152\0410\FIG_1-1.DWG

FIGURE 1-1

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899



REFERENCE PLANS:

1. US NAVY EXISTING CONDITIONS MAP, US NAVAL TORPEDO STATION, NEWPORT, RHODE ISLAND, 6/30/47
2. DRAINS, TRENCHES, ETC. GOILD ISLAND BUILDING 32 SITE, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC. CTO 286, LFA#970706, 4/25/00
3. GEOTECHNICAL SURVEY PLAN AT FORMER BUILDING 44 AND 32, US NAVAL BASE ON GOULD ISLAND, LOUIS FEDERICI & ASSOCIATES FOR BROWN & ROOT ENVIRONMENTAL, 9/8/97, DWG#970706-03
4. LOCATION OF MONITORING WELLS AT BUILDING 32 - GOULD ISLAND, U. S. NAVAL BASE NEWPORT, RHODE ISLAND, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC., 5/9/00

NOTES:

1. PLAN NOT TO BE USED FOR DESIGN.
2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
3. PHYSICAL FEATURES SHOWN MAY NOT DEPICT CURRENT CONDITIONS

HISTORICAL FEATURES				FIGURE 1-2
SITE 17, GOULD ISLAND				TETRA TECH NUS, INC.
NAVSTA NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	S. PARKER	DATE:	OCTOBER 24, 2002	
SCALE:	1" = 150'	FILE NO.: DWG\5152\0410\FIG_1-2		

Waste Characterization and Removal:

- A waste inventory was performed in 1992 to determine the contents of miscellaneous drums and other containers in the buildings in this area for disposal. Bulk hazardous materials were subsequently removed.

Environmental Investigations:

- Early sampling efforts identified the presence of metals and cyanide in the sediment and mussels around Gould Island (Loureiro Engineering Associates,, 1986).

- As part of the Building 44 closures, groundwater monitoring wells were installed to monitor contamination and a soil gas survey was conducted. Volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) were detected in the groundwater and similar contaminants were identified in the soil gas surveys, including the VOC trichloroethene (TCE) in both soil gas and groundwater.

- The first phase of a Study Area Screening Evaluation (SASE) was conducted at Building 32 in March and April 2000. The SASE found chlorinated solvents and polynuclear aromatic hydrocarbons (PAHs) in soil gas and found metals in sludge and soil samples collected.

Demolition and Removal:

- A number of buildings were removed due to their deterioration and the physical hazards they presented. This work commenced on May 1, 2000 and consisted of asbestos abatement, hazardous materials removals, and demolition of buildings to the slab elevation only.

- Polychlorinated biphenyl (PCB) sampling was conducted under Toxic Substances Control Act (TSCA) regulations. PCBs were found in concrete and soil in, under, and near transformer buildings, which were demolished in 2001 and 2002.

- Demolition of many of the underwater structures, including the former ferry slip, the fuel docks, and other unnecessary pilings is noted, but not detailed.

2.0 SITE HISTORY AND DESCRIPTION

This section presents a history of the site and general description, including topography, geology, and groundwater characteristics. This description was developed from previous investigations and published reports.

2.1 GENERAL DESCRIPTION

Gould Island is located in the East Passage of Narragansett Bay in Rhode Island, approximately 1.5 miles from the NSN shoreline. Gould Island is located between Aquidneck and Conanicut Islands, and occupies approximately 52 acres. Building 32, located on the northeast end of Gould Island, served as a torpedo overhaul shop that has been inactive since the 1950's. A Navy torpedo testing range is located on the northern tip of the island and is still active. The remainder of the island is inactive.

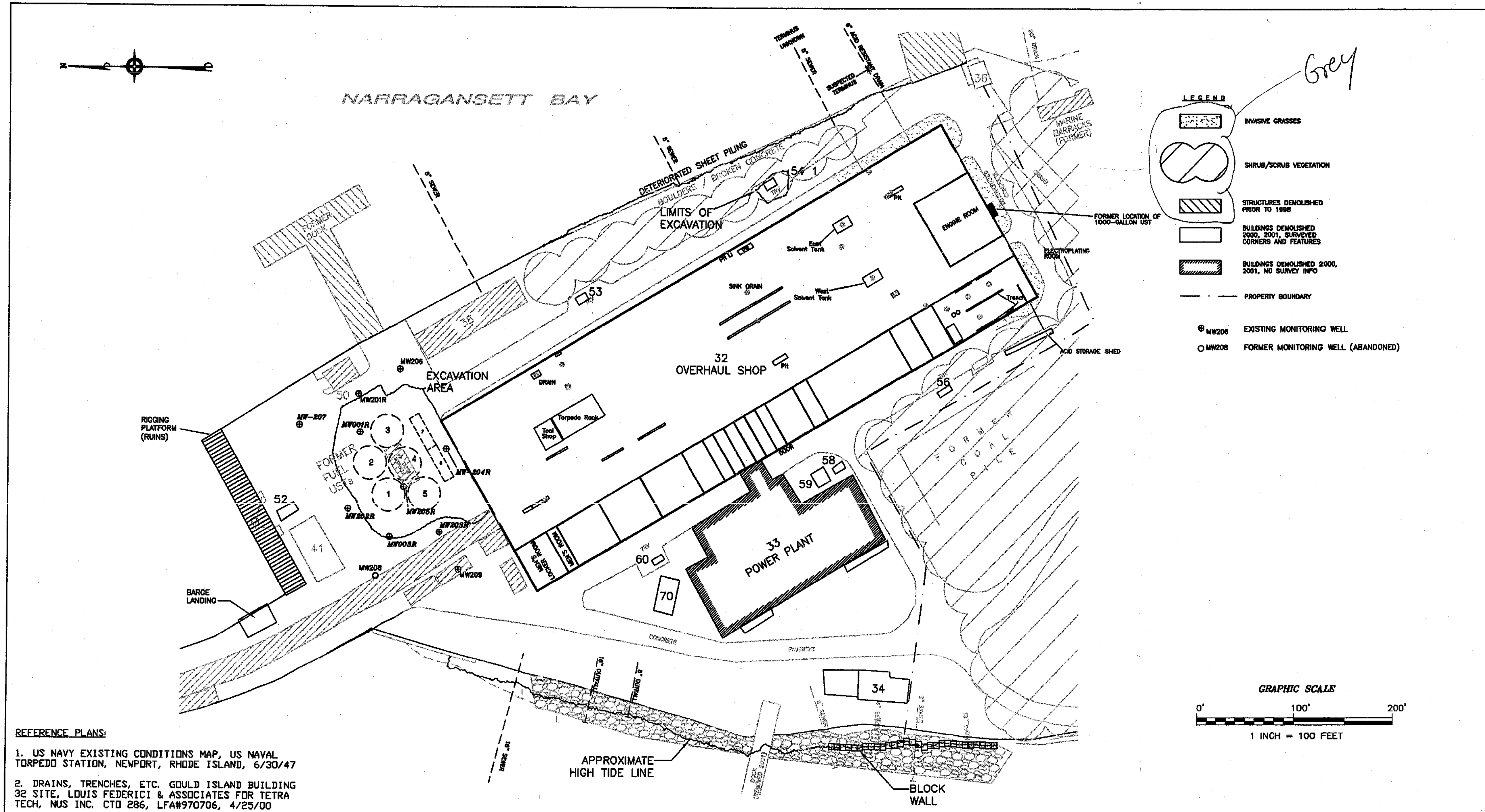
Gould Island was developed in the 1940s as a weapons support center for naval vessels. Photos taken during construction and provided in Appendix A show the island was redeveloped with housing, administration buildings and a seaplane hanger at the south end of the island; the power plant, the torpedo overhaul shop, a covered tramway, and a torpedo test firing pier were at the north end. In addition, fueling docks, two large coal piles, ammunition bunkers, and a number of other structures were present.

Gould Island is only accessible by boat and is off limits to the public, although trespassing by recreational boaters is possible.

Ownership of the southern three-fourths of the island has been transferred from the Navy to the State of Rhode Island. Naval Station Newport retains ownership of the northern end of the island, where Building 32 was located. A fence separates the two areas, as indicated on Figure 2-1.

The following is a list of structures and known activities that occurred on the Navy-held portion of the island.

- Building 32 - Torpedo Overhaul Shop
- Building 33 - Steam Plant
- Building 34 – Acetylene Generator Building
- Building 35 (South) – Support for Torpedo Firing Pier
- Building 36 – Range Maintenance Shop



REFERENCE PLANS:

1. US NAVY EXISTING CONDITIONS MAP, US NAVAL TORPEDO STATION, NEWPORT, RHODE ISLAND, 6/30/47
2. DRAINS, TRENCHES, ETC. GOULD ISLAND BUILDING 32 SITE, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC. CTO 286, LFA#970706, 4/25/00
3. GEOTECHNICAL SURVEY PLAN AT FORMER BUILDING 44 AND 32, US NAVAL BASE ON GOULD ISLAND, LOUIS FEDERICI & ASSOCIATES FOR BROWN & ROOT ENVIRONMENTAL, 9/8/97, DWG#970706-03
4. LOCATION OF MONITORING WELLS AT BUILDING 32 - GOULD ISLAND, U.S. NAVAL BASE NEWPORT, RHODE ISLAND, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC., 5/9/00

NOTES:

1. PLAN NOT TO BE USED FOR DESIGN.
2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
3. PHYSICAL FEATURES SHOWN MAY NOT DEPICT CURRENT CONDITIONS

PRIMARY SITE FEATURES				FIGURE 2–1
SITE 17, GOULD ISLAND				TETRA TECH NUS, INC. 55 Jonspin Road Wilmington, MA 01887 (978)658–7899
NAVSTA NEWPORT, RHODE ISLAND				
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	S. PARKER	DATE:	OCTOBER 24, 2002	
SCALE:	1" = 100'	FILE NO.:	DWG\5152\0410\FIG_2-1.DWG	

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- Building 38 – Use unknown
- Building 41 – Use unknown
- Building 44 – Fuel Pump House
- Building 50 – Use unknown
- Building 52 - Riggers Storage Building
- Buildings 53, 54, 56, 60, 61, 62 – Transformer Vaults
- Building 59 – Transformer Vault and Switch House
- Building 58 - Deep Well Pump House
- Building 70 – Quonset Hut
- Acid Storage Shed – Storage of material for electroplating
- Covered Tramway – Torpedo transfer from overhaul shop to firing pier
- "T" Dock - fueling, equipment transfer
- Ferry Dock – Personnel transportation
- Salt Water Intake Pier
- Rigging Platform – Heavy equipment transfer

In addition to the above, numerous temporary or portable shed structures are visible on the historic air photos. It is likely that these structures were used for storage of materials or equipment, both during construction and during operation of the facilities on the island.

2.2 SITE OWNERSHIP HISTORY

Gould Island was purchased from private landowners by the Navy in the early 1920s. Prior to that date, the land was used agriculturally. Construction of a weapons support center for naval vessels was performed in the early 1940s. Air photos from this construction show that most of the vegetation was removed from the island, and the soils were nearly completely reworked. The northern portion of the site included a torpedo overhaul and testing facility, a power plant, a fuel storage facility, and miscellaneous support structures, including a rigging platform, a stillwater basin for boat docks, an acetylene generator building, and what appear to be semi-portable storage sheds.

2.3 SITE USE HISTORY

The Building 32 facility was used for overhaul and storage of torpedoes during WW II. The building included the electroplating shop, a grinding and buffing shop, degreasing units, and equipment formerly used to overhaul torpedoes. Reportedly, extensive electroplating and degreasing operations were performed in the building between 1942 and 1945.

It is not known where or how waste materials generated from the plating and degreasing activities were disposed. It is assumed that most of the wastes (including electroplating shop wastes) from the floor trenches and floor drains were likely to have been discharged through offshore outfall pipes. The electroplating shop wastes were probably discharged through the outfall on the east side of Gould Island (Figure 2-2). The Confirmation Study Report (Louriero, 1986) suggested that the plating sludges were probably discharged in a disposal area (landfill) located on the west side of Gould Island, outside the boundary of the area of interest (Figure 1-2). Additional detail on waste generation and disposal is provided in other sections of this Background Summary Report.

In the 1950s, use of the facility was discontinued. In 1998, the buildings were deemed unsafe and were demolished in 2000. The only structure still remaining is Building 53, located on the firing pier, to the north of former Building 32.

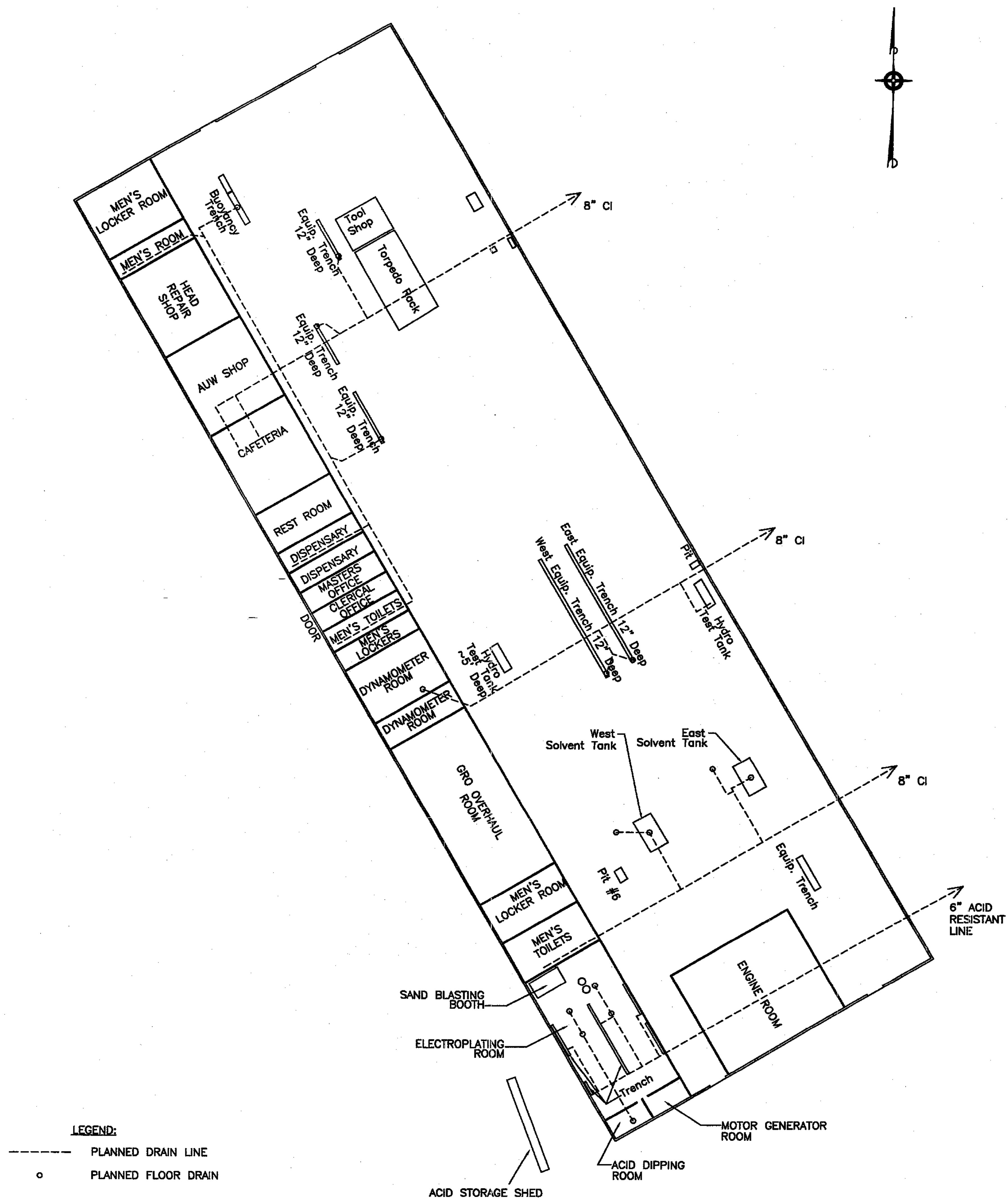
2.4 BUILDING 32 DESCRIPTION

The interior layout of Building 32 is presented in Figure 2-2. The building includes the plating rooms, a grinding and buffing shop, degreasing units, and equipment formerly used to overhaul torpedoes. Construction plans for Building 32 obtained from the NETC Public Works Department (known at the time as US Naval Operating Base, Public Works) were used to identify the interior construction, drainage, and plumbing details.

As shown on Figure 2-2, the building was designed with floor trenches and floor drains in many locations throughout the overhaul shop. There were several trenches and pits installed in the building. Some were used as sumps for mechanical equipment, and others were used to test buoyancy and other aspects of torpedo behavior in the water. In the electroplating rooms, trenches were clearly installed for capturing and disposing the waste from the electroplating tanks and systems. The design drawings indicate that trenches and drains associated with the electroplating shop are connected to a single 6-inch diameter acid-resistant pipeline that discharges to the east side of Gould Island near the former ferry slip.

The plumbing drawings for Building 32 show that floor drains as well as waste drains from the bathrooms and locker rooms were all directed into a series of 8- and 10- inch ID cast iron drain lines that ran north and east, outside the building and into the ocean. No leaching fields are shown on any of the design drawings for Building 32. The drawings also show roof drains connected to these drain lines. Other drawings show roadway drains on a different system, but also discharging storm water runoff through a series of cast iron pipes to the ocean north and east of Building 32.

W5202276D



NOTES:

1. NOT FOR DESIGN
2. ALL LOCATIONS ARE APPROXIMATE
3. VERTICAL DATUM IS BASED ON THE NAVY BM H-2, LOCATED AT THE NORTHEAST NUT ON VALVE HYDRANT OPPOSITE SOUTHWEST CORNER OF BUILDING #32, ESTABLISHED BY P.W. SURVEY PARTY, DATED 1/3/45, BOOK NUMBER 20-B PAGE 10, MLW ELEVATION (LOCAL) 14.12.
4. HORIZONTAL DATUM IS BASED ON THE NORTH AMERICAN DATUM, R.I. STATE PLANE 1983.
5. U.S. NAVAL OPERATING BASE, NEWPORT, R.I. TORPEDO STATION GOULD ISLAND OVERHAUL SHOP PLUMBING FLOOR PLAN, CONT. NO. 4994, DRAWING P-201, DATED MARCH 14, 1942, BY JOHN BRACKETT, CONSULTING ENGINEER.

GRAPHIC SCALE

0' 60' 120'

1 INCH = 60 FEET

BUILDING 32 LAYOUT AND DRAINAGE PLAN

SITE 17, GOULD ISLAND

NEWPORT, RHODE ISLAND

DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	S. PARKER	DATE:	OCTOBER 30, 2002
SCALE:	1" = 60'	FILE NO.:	DWG\5152\0410\FIG_2-2.DWG

FIGURE 2-2

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899

DRAFT

0359A112

TtNUS (formerly Brown & Root Environmental (B&RE)) conducted several site walkovers in preparation of first phase investigations, the earliest being in March 1997 (including B&RE, Navy, U.S. Environmental Protection Agency (EPA), Rhode Island Department of Environmental Management (RIDEM), etc.). During this walk, TtNUS confirmed earlier observations of the study area made by TRC (TRC, 1992), which included the following:

- Numerous metal vats were present in the plating room.

- A series of three trench drains were present running along the floor of the plating room. These drains were located along the long axis of the plating room, one on each side of the room with the third in the middle. These trench drains were partially covered with metal grates (Figure 2-2). Floor trenches were also present in the main area of Building 32.

- Several floor drains were present in the concrete floor of the plating shop and the main areas of Building 32 (Figure 2-2).

- Overhead signs were observed above several tanks. In the plating shop, individual signs read: "Chromic Acid", "Muriatic Acid", "Sulfuric and Nitric Acid", and "Caustic Soda".

In 1997, TtNUS began development of a Study Area Screening Evaluation (SASE) work plan for electroplating rooms, which included evaluation of air photos, construction drawings, and other records for the electroplating shop. As a part of this effort, TtNUS conducted another inspection of Building 32 in March 1998 to confirm existing conditions relative to the construction drawings. At that time it was observed that the trenches and testing tanks shown on the construction drawings were present as specified. However, floor drains and drainway clean outs were not installed where they are shown on the drawings. A close inspection of the building floor found floor drains in the electroplating room, the engine room, and the lavatories. While not observed directly, it was assumed at the time that drains were present in the trenches and testing tanks throughout the building, as there was little or no standing water in these trenches and tanks.

The main portion (overhaul and storage area) of the building (excluding the plating shop) was mostly open space. Most of the cement floor in the shop area was covered with a non-conductive wood block floor finish that had signs of significant water damage (buckling and staining). Several floor trenches and floor drains were located in the storage area. Debris from the deteriorated ceiling/roof was scattered on the floor area.

Two solvent tanks and washing systems were present in the main shop area, situated partially within two large sumps in the floor. A series of torpedo racks were present in the north central portion of the overhaul shop, and a large quantity of piping covered with asbestos-containing pipe insulation was stacked on the floor in the north section of the building wrapped in polyethylene sheeting.

The plating shop rooms were occupied by: numerous square, metal, open - top vats ("baths"); two concrete, open-top, round, vertical plating tanks ("pits"); several wooden benches; a small sandblasting room; a motor generator room; a small "acid dipping room" with additional baths; a small office; and floor trenches and drains (TRC, 1992). The metal baths were approximately 3 feet wide by 5 to 15 feet long. The two vertical pits were approximately 4 feet in diameter by 8 feet deep and appeared to be constructed of steel, surrounded by a thick layer of rubber. All plating room equipment was visibly empty and clean.

2.5 ENVIRONMENTAL SETTING

This section presents a general description of site features including topography, and geological, groundwater, and surface water characteristics.

2.5.1 Soil and Bedrock Characteristics

Gould Island is located at the southeastern end of the Narragansett Basin. This basin is a complex north-south-trending synclinal mass of Pennsylvanian age sedimentary rocks and is the most prominent geologic feature in eastern Rhode Island and adjacent Massachusetts. The basin is approximately 55 miles long and varies from 15 to 25 miles wide.

The rocks of the Narragansett Basin are non-marine sedimentary rocks, predominately conglomerates, sandstones, shales, and anthracite coal. Total thickness of the strata in the Narragansett Basin has been estimated at 12,000 feet. Many folds and some faults occur throughout the basin, but the character and amount of the folding and faulting are not clearly known. Bedrock of the Narragansett Basin has been divided into five units that include the Rhode Island Formation, which underlies NETC Newport.

The Rhode Island Formation is the most extensive and thickest of the Pennsylvanian formations in Rhode Island. The Rhode Island Formation in the northern portion of the basin is not metamorphosed. However, in the southern portion of the basin, as in the vicinity of NETC, the unit is metamorphosed. Bedrock types include schist of various grades, phyllites, conglomerates, and feldspathic quartzite. Thin beds of metaanthracite and anthracite were mined from many areas within the basin.

No bedrock exposures have been observed at the northern end of Gould Island. However, bedrock is exposed south of Building 32 on the east side of the island, along the shoreline. Bedrock in the vicinity of the site is mainly metamorphic rock, predominately phyllites and schists, which are exposed at outcrops at the main-base area of NETC approximately 2 miles to the east of Gould Island.

Overlying the Pennsylvanian rocks of the Narragansett Basin are surficial deposits of Pleistocene sediments. These sediments owe their origin to the Wisconsin glaciation that covered the area with ice several thousand feet thick. As the glaciers began to recede 10,000 to 12,000 years ago, unconsolidated glacial materials of variable thickness were deposited throughout the Narragansett Basin area. The unconsolidated glacial material ranges from approximately 1 to 150 feet thick; it is thicker in the valleys and thinner in the uplands. Glacial material consists of a loose till and outwash deposits characterized by sands, silty sands, and gravels. These deposits were derived from shale, sandstone, conglomerate, and, in a few places, coal. Metamorphic rock, predominantly phyllite, is also included in glacial materials that lie above the Rhode Island Formation, as observed at the Naval Station.

Soils found at the site and throughout Gould Island are classified as Newport Series by the Soil Survey of Rhode Island. These soils are formed in compact glacial till derived from dark sandstone, conglomerate, argillite, and phyllites. Permeability is generally moderate at the surface and low in the substratum (B&RE, November 1997).

2.5.2 <u>Topographic and Groundwater Characteristics</u>

Historic information (U.S. Navy, 1959) indicates that four water supply wells were drilled on Gould Island in the early 1940s. These wells were installed at different locations in an effort to find a usable fresh water supply. Two of the wells were reportedly advanced to a depth of 330 feet, while the remaining two wells were advanced to a depth of approximately 530 feet. No additional information (construction or boring logs) is available.

The reported flow capacities of the two 330-foot wells and two 530-foot wells were 7 to 35 gallons per minute (gpm) and 6 to 10 gpm, respectively. The wells yield was deemed inadequate to support island needs and therefore a fresh water supply line was extended from Aquidneck Island (U.S. Navy, 1943 and U.S. Navy, 1959). Plumbing shop drawings also show that salt water was piped through Building 32 for use in fire control systems and as flush water in the sanitary system.

Based upon a review of Gould Island topography and the island setting, shallow groundwater is anticipated to flow radially outward from the center of the island toward Narragansett Bay. Three monitoring wells installed for the UST Closure Assessment Report for the small tank on the south end of

Building 32 were used to develop a limited groundwater contour map for that location. These data indicated local groundwater flows north-northeast toward Narragansett Bay with a gradient of 0.021 foot/foot. Groundwater depths at these wells ranged between 0.77 and 2.43 feet below ground surface in August 1997. Data from the Building 44 UST closures were also used to develop a groundwater contour map for the area, at the north end of Building 32. These data indicate that groundwater at this location flows radially north, east and west toward the shoreline. Groundwater elevations range from 0.51 to 1.11 feet above mean sea level (MSL). According to the Initial Assessment Study (IAS) report (Envirodyne, 1983), groundwater on Gould Island "is generally within a depth of 10 feet".

The Prudence Island Broadway well is the closest public groundwater supply well to Gould Island. This well is located approximately 4.5 miles north of the study area across Narragansett Bay. No public supply wells are present on Gould Island.

The groundwater at the site has been classified by RIDEM as a class GA, suitable for public or private drinking water use without treatment. Several specific areas of the island have been classified as GA Non-Attainment (GA-NA). Non-attainment areas are those areas that have pollutant concentrations greater than the groundwater quality standards for the applicable classification. The goal for non-attainment areas is restoration to the groundwater quality consistent with the standards of the applicable class, in this case, GA. The non-attainment areas are apparently the sites and study areas delineated in the IAS study, described elsewhere in this report. One such non-attainment area is shown by Rhode Island Geographic Information System (RIGIS) on the southwest corner of the former Building 32 footprint, which is the former location of the electroplating shop.

2.5.3 Surface Water Characteristics

Gould Island is surrounded by Narragansett Bay. RIDEM has assigned this portion of Narragansett Bay a surface water classification of SA. Class SA waters are protected for the following uses: bathing and contact recreation, shellfish harvesting for direct human consumption, fish and wildlife habitat, boating and other secondary contact recreational activities, industrial cooling, and good aesthetic value.

3.0 OIL AND HAZARDOUS MATERIALS

This section presents information relating to the use, storage, and disposal of oil and hazardous materials at the site.

3.1 STORAGE TANKS

The following sections provide a brief description of storage tanks located at and near the Building 32 site. Findings from related investigations are presented in Section 4 of this report.

3.1.1 Building 44, Fuel Pumphouse Area

Building 44 was located immediately to the north of Building 32. Building 44 served as the pump house for the seven USTs during their use. The USTs consisted of two 5,000-gallon steel tanks and five 50,000-gallon concrete tanks. These USTs were installed in the 1940s to supply fuel to the power generation plant on Gould Island (Building 33). The 50,000-gallon USTs were constructed of reinforced concrete and were cast in place. The UST area is located north of Building 32. The locations of the former USTs and of Buildings 44 and 32 are shown on Figure 2-1.

The UST Closure Assessment report prepared by Environmental Resource Associates, Inc. (September, 1994) indicates that three of the concrete tanks stored No. 5 fuel oil and two stored No. 2 fuel oil. One of the steel USTs stored No. 2 fuel oil and the other stored alcohol. In 1989, a contract was issued by NETC to close the USTs and demolish Building 44. As a result, the two 5,000-gallon USTs were emptied and removed from the site. The five 50,000-gallon USTs were emptied and cleaned, the tank covers were destroyed, and the tanks were backfilled.

After several investigations (described in Section 4.3 of this report), the Building 44 area underwent a soil removal action in 2000. Soils exceeding the RIDEM action level for total petroleum hydrocarbons (TPH) were removed from the ground and removed from the island via dump truck and barge.

3.1.2 Building 32 UST

A 1,000-gallon steel UST containing No. 2 fuel oil was removed from the south of Building 32 in July 1997 by Brown and Root Environmental. The tank contents were removed by a portable vacuum unit, and the concrete pavement above the tank was demolished. During removal, the tank and the bedding material were inspected for evidence of release. Two corrosion holes were noted on the bottom of the tank near the western end. Water collected in the bedding material after UST removal, and a petroleum odor and a slight sheen were present on the observed groundwater (B&R Environmental, November 1997). A full description of data collected during closure operations is presented in Section 4.4 of this report.

3.2 HAZARDOUS SUBSTANCES

As previously stated, the Building 32 facility was used for overhaul and storage of torpedoes during WW II. Reportedly, extensive electroplating and degreasing operations were performed in the building between 1942 and 1945.

It is not directly known where or how waste materials generated from the plating and degreasing activities were disposed. It is assumed that any wastes (including electroplating shop wastes) released to the floor trenches and floor drains in the building were likely to have been discharged through offshore outfall pipes, as the construction drawings suggest direct discharge to the ocean (Section 2 of this report). Much of the liquid waste from the electroplating shop was probably discharged through an acid resistant drain to an outfall on the east side of Gould Island. The Confirmation Study Report (Louriero, 1986) suggested that the plating sludges were probably discharged in a disposal area, Site 14, located on the west side of Gould Island (Figure 1-2).

Waste Inventory and Sampling Reports (Halliburton NUS and ENSR, February, 1992, and July, 1992) were prepared to inventory and characterize waste materials present in Buildings 32, 33, 34, 35, and 58. The sections that follow describe the findings of these reports.

3.2.1 Waste Inventory and Sampling Report, Building 32- January 1992

Building 32 was inspected for hazardous waste materials in October 1991. Eight samples were collected from within the electroplating shop, and one sample was collected from a manhole located just outside of the doorway leading to the electroplating room from the interior of Building 32 (Figure 2-2). Five of these were liquid samples and were analyzed for corrosivity (pH), reactivity (cyanide and sulfide), flashpoint, PCBs, and all TCLP parameters. Two samples were specifically referred to as "plating solutions" and collected from vats located in the "acid dipping room" portion of the electroplating shop. The TCLP sample results showed concentrations of lead (7.8 mg/l) and cadmium (7,000 mg/l) in samples of plating solutions, which are greater than the hazardous waste characterization regulatory limits (40 CFR Part 261 Subpart C) for lead (5.0 ppm) and cadmium (1.0 ppm).

In addition, composite liquid samples were also collected and analyzed for a broad range of parameters to further characterize the materials for disposal purposes. Composite sample 1 consisted of seven samples. Composite 2 consisted of two samples. A third composite was collected of 9 aqueous sample aliquots from floor trenches in other portions of Building 32, including liquid from floor trenches near the solvent tanks, a vat in the grinding area, and the manhole outside the electroplating room. Results from the composite sample analyses are summarized in Table 3-1.

Analyses of the composite samples included BTU value, flashpoint, corrosivity (pH), reactivity (sulfide and cyanide), priority pollutant volatiles, priority pollutant semivolatiles, priority pollutant pesticides/PCBs, and metals (antimony, arsenic, cadmium, chromium, lead, manganese, potassium, sodium, and selenium).

The analytical results indicate concentrations of heavy metals in composite samples 2 and 3. Elevated levels of total cadmium (8,080 mg/l) and lead (11 mg/l) were detected in Composite 2. In addition, low levels of a volatile organic compound (bromomethane at 19 ug/l) and semivolatile organic tentatively identified compounds (TICs) at 1,476 ug/l were detected in Composite 2.

The analytical results of Composite 3 identified concentrations of total metals, two volatile organic compounds (chlorobenzene at 14J ug/l and trichloroethane at 16 ug/l), and semivolatile organic compounds (pyridine at 720 ug/l and TICs at 2,368 ug/l). Results from analysis of Composite 3 also indicated the presence of cadmium (2.1 mg/l).

3.2.2 Waste Inventory and Sampling, Building 33

ENSR reported that Building 33 was used to supply compressed air, electricity, and steam for process and heating purposes on Gould Island. The following equipment was believed to be present in Building 33:

- Four diesel engine-driven generators
- Five diesel engine-driven air compressors
- Four synchronous motor-driven air compressors
- One electric motor-driven fire pump
- One gasoline-driven fire pump
- Four low pressure, hand-fired heating boilers
- One high pressure, hand-fired heating boiler

Other file information indicated that one diesel generator and one generator in the boiler house were added in 1942. Additional auxiliary equipment was also present, such as switchboards, accumulators for compressed air, motor generators, network transformers and pumps.

The waste materials found within Building 33 were initially identified as to their likely origin, which included oil, lubrication oil, compressor oil, hydraulic oil, transformer oil, grease, tar, and glycerine, as well as sodium sulfite and sodium phosphate. In addition, two compressed gas cylinders were present, one containing oxygen, and another containing acetylene. From these materials, a series of composite samples were collected in conjunction with the materials found in Building 58. The sample results predictably indicated high concentrations of oils, hydrocarbons and varying contents of metals, including cadmium and lead. Pesticides were not detected in these samples, although low concentrations of PCBs were detected in two samples: Aroclor 1254, 5.9 mg/kg and Aroclor 1260, 13 mg/kg. These results were used for categorization of the waste under RCRA rules and for transport and disposal.

3.2.3 Waste Inventory and Sampling, Building 34: Acetylene Generator Building

Building 34 was reportedly constructed in 1942 with a footprint of approximately 1200 square feet. ENSR staff inspected the building two times in 1992 and found no potential hazardous waste materials that necessitated sampling or removal.

3.2.4 Waste Inventory and Sampling, Building 35: Firing Pier Support Structure

Little information is available as to the use of Building 35, although it included the covered tramway used for transport of the torpedos from the overhaul shop to the firing pier. It is presumed that the pier was also used to load and unload torpedos from smaller warships at dock.

Three composite samples were taken from materials within this building, as well as three discreet waste samples of unknown waste materials. Eleven drums were evaluated and sampled, as well as numerous small containers and storage bins.

One composite sample was found to contain acetone and low concentrations of metals including potassium, sodium, lead and mercury. The second composite sample was found to contain high concentrations of PAHs (napthalene, fluorine, and phenanthrene) as well as barium, chromium and lead at low concentrations. The third composite sample and one waste sample were both found to contain toluene, ethylbenzene and xylenes, as well as napthalene in the 1 % range. Traces of metals were also found in these samples, including cadmium, lead and mercury.

3.2.5 Waste Inventory and Sampling, Building 58: Deep Well House

Building 58 is identified on site maps as the deep well house. This structure is approximately 80 square feet, and had a basement and main floor at ground level. The basement contained the well head and pumping system for the well. A number of small containers of materials were present in the building and were investigated for the presence of hazardous waste.

These containers were initially evaluated as to their likely contents, which included grease, caulking compound, varnish, corrosion preventer, lubrication oil, motor oil and paints. From these materials, a series of composite samples were collected in conjunction with the materials found in Building 33. The sample results predictably indicated high concentrations of oils, hydrocarbons and varying contents of metals, including cadmium and lead. Pesticides were not detected in these samples, although low concentrations of PCBs were detected in two samples: Aroclor 1254, 5.9 mg/kg and Aroclor 1260, 13 mg/kg. These results were used for categorization of the waste under RCRA rules and for transport and disposal.

3.2.6 PCB Transformers

Buildings 53, 53, 56, 59, 60, 61, and 62 were all identified on historic drawings as transformer vaults. These small concrete buildings were later confirmed to house electrical transformers that contained PCB oil. The PCB transformers were removed prior to building demolition in 2000. Concrete chip sampling for PCB contamination was subsequently conducted on the floors and walls of the transformer vault buildings under TSCA regulations. This effort led to additional soil testing, concrete and soil removal actions, and other investigations, as detailed in Section 5 of this report.

TABLE 3-1
ANALYTICAL RESULTS FOR COMPOSITE LIQUID SAMPLES
FROM THE "WASTE INVENTORY SAMPLING REPORT" (ENSR, 1992)
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

SAMPLE NUMBER	COMPOSITE 1	COMPOSITE 2	COMPOSITE 3
DESCRIPTION OF COMPOSITES	T-16, T-17, T-24, T-25, T-28, T-29, T-30	T-26, T-27	T-6:(L1, L2), T-7 T-8, T-9, T-10, T-12, T-22, T-23 MH-1
ANALYSIS			
BTU (BTU/LB)	157	0	16
Flashpoint (C)	>60	>60	>60
Corrosivity (SI units)	6.5	6.5	7.5
Reactive Sulfide (mg/l)	<1.0	<1.0	<1.0
Reactive Cyanide (mg/l)	<0.25	<0.25	<0.25
Volatiles (ug/l)			
Bromomethane	ND	19	ND
Chlorobenzene	ND	ND	14 J
Trichloroethane	ND	ND	16
Semivolatiles (ug/l)	ND	ND	ND
Tentatively ID'd Compounds (TICs)	25	1476	2368
1Methyl, 2-Benzene	ND	104	ND
Pyridine	ND	ND	720
Pesticides/PCB (ug/l)	ND	ND	ND
Metals (total) (mg/l)			
Antimony	0.030	0.30	
Arsenic	0.004		0.007
Cadmium	0.580	8,080	2.10
Chromium	0.073	1.10	0.15
Lead	1.500	11.0	1.7
Lithium		0.33	0.62
Manganese	1.870	20.7	2.4
Potassium	66.5	445	397
Silver		0.41	0.10
Sodium	167	6,560	2,260
Strontium	0.140	13.5	0.90

NOTE: - Available sample locations are presented in Appendix D.

Reference: ENSR Consulting and Engineering, February 14, 1992, Waste Inventory and Sampling Report for Buildings 32 and 35 (Inactive), Naval Underwater Systems Center (NUSC), Gould Island Annex, Newport, Rhode Island, prepared for the Northern Division, Naval Facilities Engineering Command under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Program.

4.0 PREVIOUS ENVIRONMENTAL INVESTIGATIONS AND FINDINGS

This section presents a discussion of site use history and the findings of previous environmental investigations performed at the site.

4.1 INITIAL ASSESSMENT STUDY (ENVIRODYNE ENGINEERS, 1983)

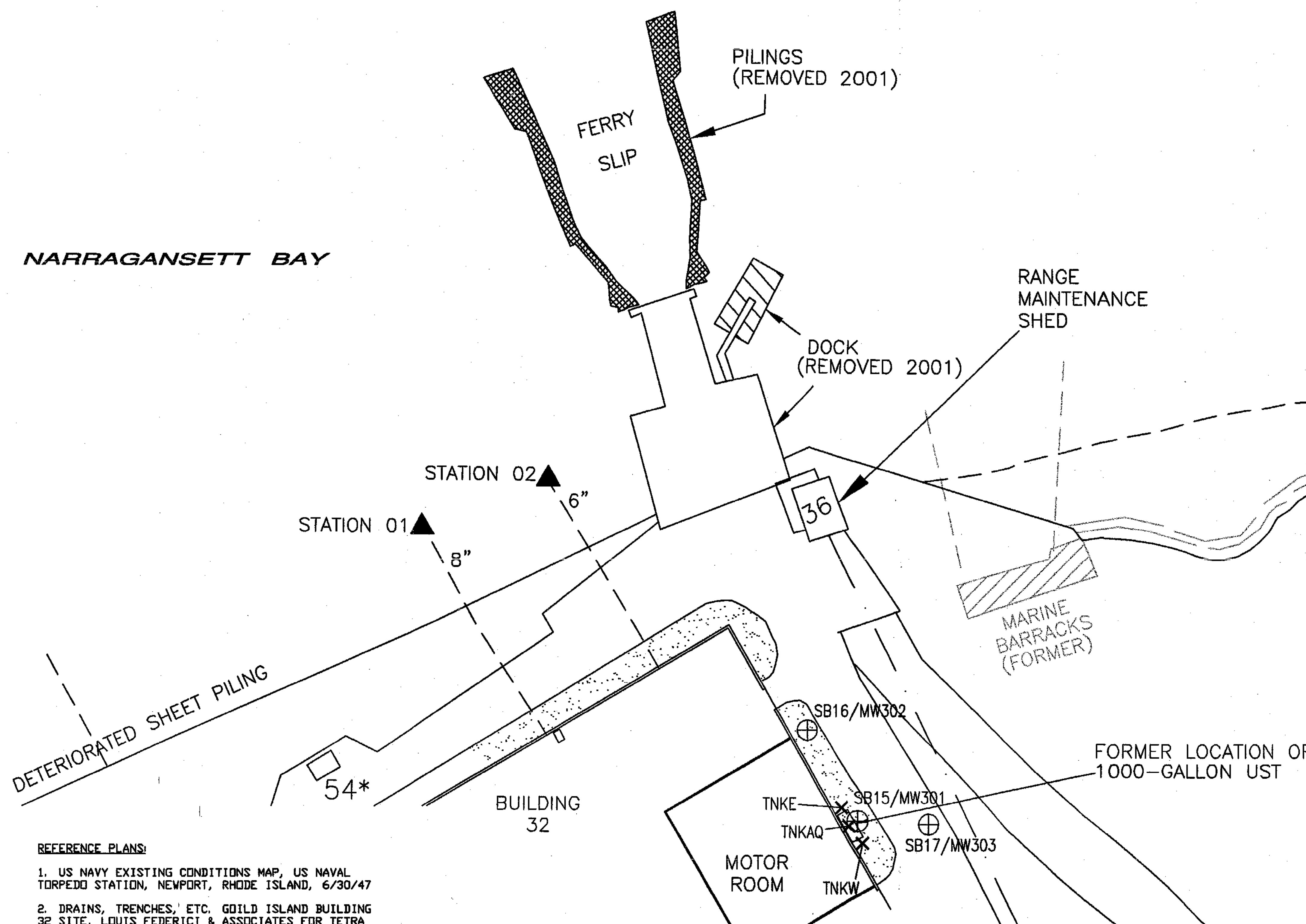
The Initial Assessment Study (IAS) was performed in 1983 by Envirodyne Engineers. The IAS was an evaluation of the entire NETC property to identify possible environmental disposal sites. During this study Envirodyne identified the Gould Island Electroplating Shop as a location where potential contamination from past waste disposal or handling practices may pose human health or environmental risks. During the Envirodyne study, bulk chemicals, including electroplating solutions were still present in some of the tanks and baths located in the unused electroplating rooms of Building 32 (Section 3.2 of this report). Because of the history of use of the chemicals in the electroplating rooms and because the fate of the wastes that were generated was unknown, the IAS recommended the site be investigated further. Therefore, Verification and Confirmation Studies were performed in 1984 and 1986, respectively.

4.2 VERIFICATION STUDY AND CONFIRMATION STUDY (LOURIERO ENGINEERING, 1984 AND 1986)

After the submittal of the IAS, a "verification step" was performed, to verify the presence of contaminants at the "Sites" identified in the IAS. Subsequently a "confirmation study" was also performed two years after the "Verification Step", both the verification and confirmation studies involved limited sampling programs. The Confirmation Study (CS) indicated that two offshore discharge pipes were present directly east of Building 32 in Narragansett Bay. The general locations of the discharge pipes are shown on Figure 4-1. The end of one of the discharge pipes was located during the CS. The end of the other pipe was not located, reportedly due to the presence of silt and vegetation over the pipe.

Sediment samples were collected from Stations 01 and 02, which were reportedly approximately 25 feet off shore in 1 to 3 feet of water. The sediment deposits, collected from a depth of 0 to 4 inches, were reportedly stony silt and sand. The mussel samples were collected from the intertidal zone shoreward of sediment sampling Stations 01 and 02 (Figure 4-1).

Sediment and mussel samples were analyzed for metals (lead, copper, chromium, nickel, cadmium, mercury, silver) and cyanide (sediments only) as reported in the CS report. Sediment and mussel samples were also collected from two control stations (NI and N2) and were analyzed for metals and cyanide (sediment only). Control Station N-1 was located on Aquidneck Island (end of Corey Lane in Portsmouth) and control station N-2 was located off Conanicut Island (off Route 138 north of the Newport Bridge). It was



LEGEND

- INVASIVE GRASSES
- STRUCTURES DEMOLISHED PRIOR TO 1998
- BUILDINGS DEMOLISHED 2000, 2001, SURVEYED CORNERS AND FEATURES
- PROPERTY BOUNDARY
- SB16/MW302 — SOIL BORING/ MONITORING WELL LOCATION

GRAPHIC SCALE

0' 50' 100'

1 INCH = 50 FEET

NOTES:

1. PLAN NOT TO BE USED FOR DESIGN.
2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
3. PHYSICAL FEATURES SHOWN MAY NOT DEPICT CURRENT CONDITIONS

REFERENCE PLANS:

1. US NAVY EXISTING CONDITIONS MAP, US NAVAL TORPEDO STATION, NEWPORT, RHODE ISLAND, 6/30/47
2. DRAINS, TRENCHES, ETC. GOILD ISLAND BUILDING 32 SITE, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC. CTO 286, LFA#970706, 4/25/00
3. GEOTECHNICAL SURVEY PLAN AT FORMER BUILDING 44 AND 32, US NAVAL BASE ON GOULD ISLAND, LOUIS FEDERICI & ASSOCIATES FOR BROWN & ROOT ENVIRONMENTAL, 9/8/97, DWG#970706-03
4. LOCATION OF MONITORING WELLS AT BUILDING 32 - GOULD ISLAND, U. S. NAVAL BASE NEWPORT, RHODE ISLAND, LOUIS FEDERICI & ASSOCIATES FOR TETRA TECH, NUS INC., 5/9/00

PREVIOUS SAMPLING LOCATIONS				FIGURE 4-1
SITE 17, GOULD ISLAND				TETRA TECH NUS, INC.
NAVSTA NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	S. PARKER	DATE:	OCTOBER 31, 2002	
SCALE:	1" = 50'	FILE NO.:	DWG\5152\0410\FIG_4-1.DWG	

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observed at the time that control Station N-1 was located adjacent to a sewage outfall. The control station sediments were reported as being stony at both locations, particularly at Station N-1. Data from this effort is presented on Table 4-1.

The "Verification Step" sediment sample data does show that cyanide was detected at concentrations higher (approximately four times greater) than those detected in the control samples, and copper was detected at an elevated level (above the control sample) in the Station 01 sediment sample. In addition, copper was also detected at a higher concentration in the Station 02 mussel sample (26.3 ppm) than that detected in the Station 01 mussel sample (6 ppm) and the control mussel samples (4.3 and 7.2 ppm).

Under the "Characterization Step" of the CS, the mussels at Station 02 were re-sampled as a check on the metals concentrations detected previously in the "Verification Step". This single mussel sample was analyzed for lead, copper, chromium, and nickel. The sample results indicate that the detected metals concentrations in mussel at Station 02 are similar to those detected in the "Verification Step" control samples.

The CS recommended that "no further studies or remedial actions are needed at this site because the levels of contaminants found are not significantly high" (Louriero Engineering, 1986).

4.3 STUDIES FOR BUILDING 44 - PUMPHOUSE

Several studies have also been conducted to assess the former Pump House (Building 44) which was located approximately 50 feet north of Building 32. These studies included a UST Closure Assessment Report (Environmental Resource Associates, Inc., 1994), Site Investigation -Groundwater Investigation [Quad Three Group (Q3G), 1995], Phase I Environmental Assessment (Q3G, 1996), Supplemental Site Investigation (Q3G, 1997), and Underground Storage Tank Site Investigation Report (B&RE, 1997). Figure 4-2 depicts the Building 44 area discussed in this section.

4.3.1 Building 44 UST Closure Assessment-1994

A UST closure assessment report was prepared for the Building 44 area by Environmental Resource Associates in September 1994. This assessment, conducted in July 1994, confirmed that the tanks had been abandoned and recommended that RIDEM issue a Certificate of Closure to the NETC. However, test pits excavated in the vicinity of the former USTs revealed significant free-floating product that appeared to be weathered black oil.

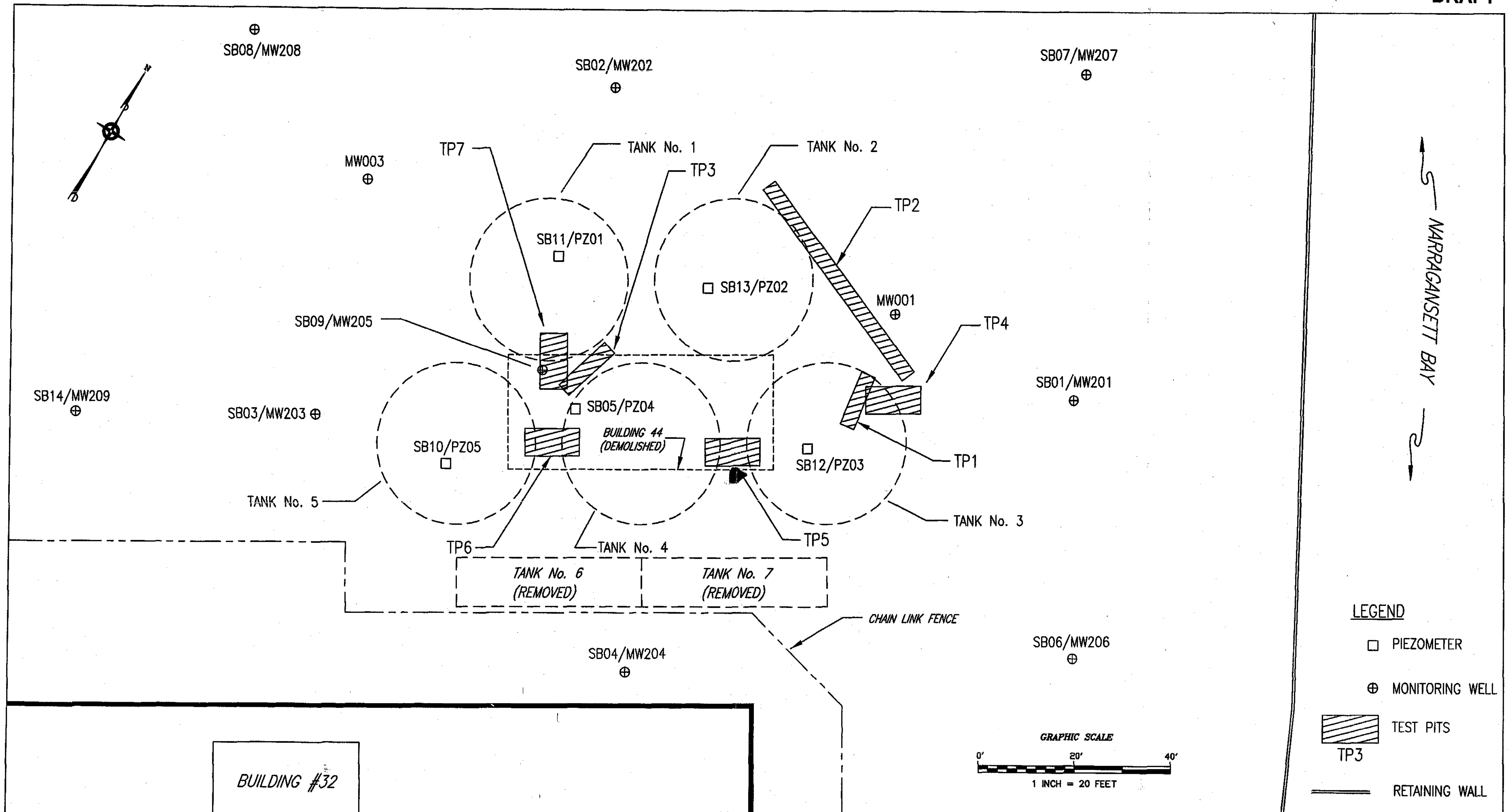
TABLE 4-1
ANALYTICAL RESULTS FOR SEDIMENT AND MUSSEL SAMPLES
FROM THE "CONFIRMATION STUDY REPORT" (LOUREIRO ENGINEERING, 1986)
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

STATION NUMBER	01	02	N-1 (control station)	N-2 (control station)	N-2 (control duplicate)
MEDIA AND ANALYSIS					
SEDIMENT - December 1983					
Cyanide	0.121	0.111	0.031	0.027	NA
Chromium	<0.25	<0.25	11.5	8.0	NA
Cadmium	<0.05	<0.05	<0.05	<0.05	NA
Lead	<0.5	6.5	27.5	6.8	NA
Mercury	<0.02	<0.02	<0.02	<0.02	NA
Silver	<0.5	<0.5	<0.5	<0.5	NA
Copper	26.0	17.4	18.3	10.3	NA
Nickel	<0.25	<0.25	21.3	11.3	NA
MUSSELS - December 1983					
Chromium	<2.5	<2.5	<2.5	<2.5	NA
Cadmium	<0.5	<0.5	<0.5	<0.5	NA
Lead	<1.0	<1.0	<1.0	<1.0	NA
Mercury	<0.04	<0.04	<0.04	<0.04	NA
Silver	<1.0	<1.0	<1.0	<1.0	NA
Copper	6.0	26.3	7.2	4.3	NA
Nickel	<2.5	<2.5	<2.5	<2.5	NA
MUSSELS - September 1984					
Chromium	NS	1.0	1.1	2.8	1.4
Lead	NS	5.0	4.9	3.8	5.2
Copper	NS	6.6	6.8	8.2	5.4
Nickel	NS	3.9	4.9	5.1	4.9

NOTES:
- All results in ug/gm (dry weight basis).
- Available sample locations are presented in Appendix D.
- Sediments reportedly collected from a depth of 0 to 4 inches.
- NS = not sampled
- NA = not applicable

Reference: Loureiro Engineering Associates, May 15, 1986, Confirmation Study Report on Hazardous Waste Sites at Naval Education and Training Center, Newport, RI, prepared for the Northern Division, Naval Facilities Engineering Command.

DRAFT



BUILDING 44 UST CLOSURE ASSESSMENT SAMPLE STATIONS				FIGURE 4–2
SITE 17, GOULD ISLAND				TETRA TECH NUS, INC.
NAVSTA NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	S. PARKER	DATE:	NOVEMBER 4, 2002	
SCALE:	1" = 20'	FILE NO.:	DWG\5152\0410\FIG_4-2.DWG	

4.3.2 Building 44 Phase 1 Environmental Assessment - 1995 and 1996

A Site Investigation was conducted by Q3G in April 1995, which concluded that groundwater and soil at the former Building 44 site had been impacted by petroleum contamination. Their report published in May 1995 recommended further investigation.

A Phase I Environmental Assessment, dated March 1996, and a Supplemental Site Investigation (SSI), dated September 1996, both conducted by Q3G, followed the May 1995 investigation at Building 44. The SSI report identified the USTs as the source of impact to groundwater and recommended the installation of four groundwater monitoring wells and development of a site-specific corrective action plan (CAP). One of the tasks performed by the Q3G for the SSI was a soil gas survey. This was accomplished in the area North of Building 32 and extending to the base of the Firing Pier. Sixty-nine "Gore-Sorber" modules were placed in a grid formation in this area. This study found petroleum - related compounds, particularly benzene, toluene, ethyl benzene, and xylenes in most of the modules placed within this area. Trichloroethene (TCE) was also detected, with highest concentrations located 75 feet northwest of Building 32, and 150 feet west of the former Building 44 location.

Q3G conducted a supplemental site investigation that focused on underground utility conduits, aboveground and underground storage tanks, and structures within the study area. A Gore-Sorber soil gas screening survey was conducted along with soil sampling to determine if there was a relationship between soil gas and soil contaminants. After a comparison of the Gore-Sorber sample results with the soil analytical results, Q3G concluded that no direct correlation existed between the soil contamination and contaminants in the soil vapor. Q3G concluded that the source of contaminants identified by the Gore-Sorber soil gas survey modules was contaminated groundwater. Q3G concluded that metals found in the soil originated from sources other than the USTs. This investigation recommended that four additional groundwater monitoring wells be installed in those areas identified by the Gore-Sorber modules as being the most severely impacted.

4.3.3 UST Site Investigation of Building 44 Area - 1997

A UST Site Investigation was conducted by B&RE and reported in November 1997. Tasks included overburden soil boring advancement and soil sample collection, monitoring well installation, groundwater sampling, test pitting, hydraulic conductivity testing, groundwater-level measurements, and tidal influence testing. Figure 4-2 depicts the soil testing locations. Table 4-2 presents a summary of the analysis on soil samples collected during this 1997 investigation.

TABLE 4-2
SOIL SAMPLE DATA SUMMARY
FROM THE BUILDING 44 SITE INVESTIGATION REPORT
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

SAMPLE IDENTIFICATION NO.	SB01-0911	SB02-0911	SB03-0407	SB04-0507	SB04-0507 DUP. SB40	SB06-0810	RIDEM DIRECT EXPOSURE CRITERIA(1)	
							RES(2)	IND/COM(3)
SAMPLE MEDIUM	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	mg/kg	mg/kg
PARAMETERS (mg/kg)								
Total Petroleum Hydrocarbons	240	1400	3800	140	210	63	500	2500
TCL VOCs (mg/kg)								
Methylene Chloride	0.046	0.072	0.42	0.03	0.03	0.003	45	760
Acetone	0.12	0.12	0.073	0.015J	0.016J	ND	7800	10000
Carbon disulfide	0.0009J	ND	ND	ND	ND	ND	-	-
Chloroform	ND	ND	ND	ND	ND	ND	1.2	940
2-Butanone	ND	ND	ND	ND	ND	ND	-	-
Toluene	ND	ND	0.004	ND	ND	ND	190	10000
Ethylbenzene	ND	ND	ND	ND	ND	ND	71	10000
Total Xylenes	ND	ND	ND	ND	ND	ND	110	10000
TCL SVOCs (mg/kg)								
Naphthalene	0.44	ND	ND	ND	ND	ND	54	10000
2-Methylnaphthalene	2.0	ND	ND	ND	ND	ND	123	10000
Acenaphthene	ND	ND	ND	ND	ND	ND	43	10000
Dibenzofuran	0.24J	0.62	ND	ND	ND	ND	-	-
Fluorene	0.32J	0.65	0.5	ND	ND	ND	28	10000
Phenanthrene	0.31J	0.48	0.42	ND	0.3J	0.19J	40	10000
Anthracene	ND	ND	ND	ND	ND	ND	35	10000
Carbazole	ND	ND	ND	ND	ND	ND	-	-
Di-n-butylphthalate	ND	ND	ND	ND	0.27J	ND	-	-
Fluoranthene	ND	ND	0.44	ND	0.35J	0.58	20	10000
Pyrene	ND	ND	0.55	ND	0.25J	0.53	13	10000
Benzo(a)anthracene	ND	ND	0.32J	ND	ND	0.23J	0.9	7.8
Chrysene	ND	ND	0.32J	ND	ND	0.25J	0.4	780
Bis(2-ethylhexyl) phthalate	0.49	0.63	1.7	0.3J	ND	ND	46	410
Benzo(b)fluoranthene	ND	ND	0.21J	ND	ND	0.22J	0.9	7.8
Benzo(k)fluoranthene	ND	ND	0.18J	ND	ND	ND	0.9	78
Benzo(a)pyrene	ND	ND	0.25J	ND	ND	0.22J	0.4	0.8
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND	0.9	7.8
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	0.8	10000

TABLE 4-2 (cont.)
SOIL SAMPLE DATA SUMMARY
FROM THE BUILDING 44 SITE INVESTIGATION REPORT
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND
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SAMPLE IDENTIFICATION NO.	SB07-0810	SB08-0709	SB09-0608	SB14-0608	RIDEM DIRECT EXPOSURE CRITERIA(1)	
					RES(2)	IND/COM(3)
SAMPLE MEDIUM	SOIL	SOIL	SOIL	SOIL	mg/kg	mg/kg
PARAMETERS (mg/kg)						
Total Petroleum Hydrocarbons	78	28	2700	ND	500	2500
TCL VOCs (mg/kg)						
Methylene Chloride	0.038	0.008	0.013	0.005	45	760
Acetone	0.027	0.012	0.034	0.006	7800	10000
Carbon disulfide	ND	ND	ND	ND	-	-
Chloroform	0.002	0.002	0.002	ND	1.2	940
2-Butanone	0.007	0.003J	0.011	ND	-	-
Toluene	0.002	ND	0.002	0.002	190	10000
Ethylbenzene	0.0007J	0.0006J	0.006	0.0006J	71	10000
Total Xylenes	0.002	0.003	0.004	0.003	110	10000
TCL SVOCs (mg/kg)						
Naphthalene	ND	ND	0.3J	ND	54	10000
2-Methylnaphthalene	ND	ND	1100	ND	123	10000
Acenaphthene	3.1	ND	ND	ND	43	10000
Dibenzofuran	2.2	ND	0.34J	ND	-	-
Fluorene	3.3	ND	0.6	ND	28	10000
Phenanthrene	7.5	ND	0.82	ND	40	10000
Anthracene	3.1	ND	ND	ND	35	10000
Carbazole	0.73	ND	ND	ND	-	-
Di-n-butylphthalate	0.31J	0.027J	0.29J	ND	-	-
Fluoranthene	8.2	ND	0.26J	ND	20	10000
Pyrene	5.3	ND	0.29J	ND	13	10000
Benzo(a)anthracene	1.9	ND	ND	ND	0.9	7.8
Chrysene	2	ND	ND	ND	0.4	780
Bis(2-ethylhexyl) phthalate	0.32J	0.028J	ND	0.19J	46	410
Benzo(b)fluoranthene	0.81	ND	ND	ND	0.9	7.8
Benzo(k)fluoranthene	0.94	ND	ND	ND	0.9	78
Benzo(a)pyrene	0.91	ND	ND	ND	0.4	0.8
Indeno(1,2,3-cd)pyrene	0.37	ND	ND	ND	0.9	7.8
Benzo(g,h,i)perylene	0.28J	ND	ND	ND	0.8	10000

TABLE 4-2 (cont.)
SOIL SAMPLE DATA SUMMARY
FROM THE BUILDING 44 SITE INVESTIGATION REPORT
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND
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SAMPLE IDENTIFICATION NO.	SB01-0911	SB02-0911	SB03-0407	SB04-0507	SB04-0507	SB06-0810	RIDEM DIRECT EXPOSURE CRITERIA[(1)]	
							RES[(2)]	IND/COM[(3)]
SAMPLE MEDIUM	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	mg/kg	mg/kg
INORGANICS (mg/kg)								
Arsenic	0.79	0.99	0.91	1.2	1	2	1.7	820
Barium	16.7	13.8	22.1	12.4	11.7	28.9	5500	10000
Cadmium	0.08	0.07	0.14	ND	0.08	0.21	39	1000
Chromium	11.3	9.2	10.2	7.8	8.6	7.9	390[(4)]	10000[(4)]
Lead	5.4	4.6	6.9	4.9	5.4	18	150	500
Mercury	0.03	0.02	ND	0.01	ND	0.1	23	610
Selenium	ND	ND	0.3	0.29	ND	0.36	390	10000

SAMPLE IDENTIFICATION NO.	SB07-0810	SB08-0709	SB09-0608	SB14-0608	RIDEM DIRECT EXPOSURE CRITERIA[(1)]	
					RES[(2)]	IND/COM[(3)]
SAMPLE MEDIUM	SOIL	SOIL	SOIL	SOIL	mg/kg	mg/kg
INORGANICS (mg/kg)						
Arsenic	1.4	1.6	1.4	1.4	1.7	820
Barium	18.2	24.8	27.4	25.0	5500	10000
Cadmium	0.07	0.11	0.15	.008	39	1000
Chromium	8.8	9.6	9.5	10.4	390[(4)]	10000[(4)]
Lead	39.7	4.8	11.3	6.2	150	500
Mercury	ND	ND	ND	ND	23	610
Selenium	0.32	ND	ND	ND	390	10000

Notes: (1) Rhode Island Department of Environmental Protection Remediation Regulations - March 31, 1993; Amended August 1996
(2) RES is the Residential Direct Exposure Criterion
(3) IND/COM is the Industrial/Commercial Direct Exposure Criterion
(4) Exposure Criteria for Chromium VI
J - Estimated value
ND - Not detected

The UST Site Investigation found TPH concentrations exceeding RIDEM GA Leachability Criteria (500 mg/kg), RIDEM Residential Direct Exposure Criteria (500 mg/kg) or exceeding RIDEM Industrial/Commercial Direct Exposure Criteria (2,500 mg/kg) at three of the 10 sample locations (SB02, SB03, SB09). One SVOC, benzo(a)pyrene (0.91 mg/kg) exceeded the RIDEM Residential and Industrial/Commercial Direct Exposure Criteria (0.8 mg/kg). The three compounds identified at levels exceeding the residential criteria are benzo(a)anthracene (1.9 mg/kg), chrysene (2 mg/kg), and benzo(k)fluoranthene (0.94 mg/kg). No VOCs were detected in soils exceeding RIDEM Residential or Industrial/Commercial Direct Exposure Criteria, or RIDEM GA Leachability Criteria. For metals analyses, arsenic was identified in soil at one boring location (2 mg/kg at SB06) exceeding the RIDEM Residential Direct Exposure Criteria of 1.7 mg/kg.

A summary of the analysis of groundwater samples collected during this investigation is presented in Table 4-3. Analysis of groundwater samples indicated the presence of TPH in four of the eleven wells tested. TPH was identified at one location at 1,700 mg/L (MW001) and the remaining three locations at 1.8 to 6.4 mg/L. One volatile organic compound was identified (methylene chloride at 73 ug/L at MW001) exceeding the GA Groundwater Objective of 5 ug/L at one well location. One SVOC (naphthalene at 200 ug/L) was detected in excess of the GA Groundwater Objective of 20 ug/L at MW001. For metals analyses, lead was identified in samples obtained from seven of the 10 sampled wells at levels exceeding the RIDEM Groundwater Objective for GA areas of 15 ug/L. Exceedances ranged from 15.8 ug/L (MW204) to 243 ug/L (MW003).

Tidal influence testing was performed on two piezometers (PZ-02 and PZ-05, placed in the UST cavities) and one well (MW-201) to the east of the former tank locations. The piezometers showed no tidal influence, and MW-201, located within 50 feet of the east shoreline, showed a tidal fluctuation of 0.75 feet. Tidal change at the shoreline during the period was measured at 4 feet (B&R Environmental, November 1997).

Also as a part of the 1997 site investigation, a series of test pits were excavated to determine the nature of anomalies detected in the subsurface materials by Q3G in 1996. These were found to be likely a result of fragments of the piping systems that remained in the ground following the UST closures. However, oil-stained soils and non-aqueous phase oil was found in the ground during test pit operations (see below, Section 4.3.4).

4.3.4 Building 44 Corrective Action Excavation – 2000

A corrective action plan prepared by TtNUS recommended removal of the affected soils and long-term groundwater monitoring. In the fall of 2000 Foster Wheeler Environmental Corporation completed the UST removal and soil excavation phase in conjunction with the Building 32 demolition activities.

TABLE 4-3
GROUNDWATER SAMPLE DATA SUMMARY
FROM THE BUILDING 44 SITE INVESTIGATION REPORT
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

SAMPLE IDENTIFICATION NO.	MW201	MW202	MW203	MW204	MW205	MW206	MW207	GA GROUNDWATER OBJECTIVE(1)
SAMPLE MEDIUM	**AQ**	**AQ**	**AQ**	**AQ**	**AQ**	**AQ**	**AQ**	**ug/l**
PARAMETERS (mg/L)								
Total Petroleum Hydrocarbons	1.8	1.8	6.4	ND	-	ND	ND	-
TCL VOCs (ug/L)								
Methylene Chloride	1	2	3	3	2	3	3	5
Acetone	ND	4J	3J	ND	8	4J	ND	-
Carbon disulfide	ND	ND	ND	ND	ND	ND	ND	-
Chloroform	ND	ND	ND	4	0.8J	3	ND	100(2)
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	100(2)
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	5
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	100(2)
Benzene	0.8J	ND	ND	ND	ND	ND	ND	5
Toluene	ND	ND	ND	ND	ND	ND	ND	1000
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	700
Total Xylenes	ND	0.7J	ND	0.7J	ND	ND	ND	10,000
TCL SVOCs (ug/L)								
Naphthalene	ND	ND	ND	ND	ND	ND	ND	20
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND	-
Acenaphthene	ND	ND	ND	ND	ND	ND	15	-
Dibenzofuran	ND	ND	ND	ND	ND	ND	ND	-
Fluorene	ND	ND	ND	ND	ND	ND	ND	-
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	-
Bis(2-ethylhexyl) phthalate	5J	69	8J	17	11J	19	5J	-

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TABLE 4-3 (cont.)
GROUNDWATER SAMPLE DATA SUMMARY
FROM THE BUILDING 44 SITE INVESTIGATION REPORT
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND
PAGE 2 OF 3

SAMPLE IDENTIFICATION NO.	MW208	MW209	MW210 DUP. MW201	MW211 DUP. MW 203	MW001	MW003	GA GROUNDWATER OBJECTIVE(1)
SAMPLE MEDIUM	AQ	AQ	AQ	AQ	AQ	AQ	ug/l
PARAMETERS (mg/L)							
Total Petroleum Hydrocarbons	ND	ND	2.6	5.9	1700	ND	-
TCL VOCs (ug/L)							
Methylene Chloride	2	1	1	3	73	2	5
Acetone	3J	3J	3J	5J	79J	3J	-
Carbon disulfide	ND	ND	ND	3	ND	ND	-
Chloroform	ND	1	ND	ND	ND	ND	100(2)
Bromodichloromethane	ND	1J	ND	ND	ND	ND	100(2)
Trichloroethene	ND	1	ND	ND	ND	ND	5
Dibromochloromethane	ND	0.8J	ND	ND	ND	ND	100(2)
Benzene	ND	ND	0.9J	ND	ND	ND	5
Toluene	ND	ND	ND	ND	69	ND	100
Ethylbenzene	ND	ND	ND	ND	37	ND	700
Total Xylenes	ND	ND	ND	ND	120	2	10,000
TCL SVOCs (ug/L)							
Naphthalene	ND	ND	ND	ND	200	ND	20
2-Methylnaphthalene	ND	ND	ND	ND	720	ND	-
Acenaphthene	ND	ND	ND	ND	ND	ND	-
Dibenzofuran	ND	ND	ND	ND	60	ND	-
Fluorene	ND	ND	ND	ND	42	ND	-
Phenanthrene	ND	ND	ND	ND	65	ND	-
Bis(2-ethylhexyl) phthalate	18	6J	12	17	ND	7J	-

TABLE 4-3 (cont.)
GROUNDWATER SAMPLE DATA SUMMARY
FROM THE BUILDING 44 SITE INVESTIGATION REPORT
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND
PAGE 3 OF 3

SAMPLE IDENTIFICATION NO.	MW201	MW202	MW203	MW204	MW205	MW206	MW207	GA GROUNDWATER OBJECTIVE(1)
SAMPLE MEDIUM	AQ	AQ	AQ	AQ	AQ	AQ	AQ	ug/l
INORGANICS (ug/L)								
Arsenic	14	3	14	6.2	14.1	8.8	8.3	-
Barium	212	65.7	179	99.2	164	168	144	2000
Cadmium	ND	0.20	ND	ND	ND	ND	0.25	5
Chromium	49.4	5.9	50.7	21.1	30	21	36.5	100
Lead	30	10.2	38.1	15.8	49.9	37.3	35.7	15
Mercury	0.01	0.03	ND	ND	0.02	0.07	0.03	2
Silver	ND	ND	ND	ND	ND	ND	ND	-

SAMPLE IDENTIFICATION NO.	MW208	MW209	MW210 DUP. MW201	MW211 DUP. MW203	MW003	GA GROUNDWATER OBJECTIVE(1)
SAMPLE MEDIUM	AQ	AQ	AQ	AQ	AQ	ug/l
INORGANICS (ug/L)						
Arsenic	4.4	4.2	18.4	12.3	20.7	-
Barium	53.1	98.9	317	171	258	2000
Cadmium	ND	ND	ND	ND	8.8	5
Chromium	8.5	24.6	80	43.4	16.2	100
Lead	12.7	12.7	48.4	31	243	15
Mercury	0.05	0.03	0.01	ND	0.33	2
Silver	ND	ND	ND	ND	2	-

Notes: (1) Rhode Island Department of Environmental Protection Remediation Regulations - March 31, 1993; Amended August 1996
(2) Total Trihalomethanes GA Groundwater Objective
J - Estimated value
ND - Not detected

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Demolition debris (red brick and crushed concrete) was used to back-fill the USTs excavation at the former Building 44 site. Some monitoring wells destroyed during this effort were subsequently replaced for subsequent groundwater monitoring. The approximate excavation area is depicted on Figure 2-1.

4.3.5 Building 44 Interim Monitoring – 2001 and 2002

The groundwater monitoring program was undertaken to confirm residual contamination is not entering the surficial aquifer and to recover mobile free product, if detected. In addition, the monitoring results will be used to determine if the existing network of wells is adequate to monitor any contaminant migration. This section summarizes evaluation of the data from the three rounds of corrective action groundwater monitoring.

Three semi-annual groundwater sampling rounds were conducted at the site, beginning in April 2001. Site monitoring wells are shown in Figure 4-2. The designated wells for the corrective action groundwater monitoring program consisted of seven of the eleven overburden wells that existed at the site prior to the soil remediation. A summary of data from the first three rounds of groundwater monitoring is presented in Tables 4-4 and 4-5.

During each sampling round, designated wells were sampled using bailers and groundwater levels were measured using an electronic oil/water interface probe. The probe was also used to check for the presence of dense or light non-aqueous phase liquid (DNAPL or LNAPL) or free product layers in all serviceable monitoring wells. Samples were shipped to an off-site laboratory to be analyzed for VOCs (USEPA SW-846 Method 8260B); SVOCs (USEPA SW-846 Method 8270C); GRO (USEPA SW-846 Method 8015M); DRO-TPH by USEPA SW-846 Method 8015M/8100M; and total and dissolved metals by USEPA SW-846 Methods 6010B/7471A.

Groundwater elevation measurements during Rounds 1 and 2 indicated that the groundwater flows away from the former UST area to the north, east and west, toward Narragansett Bay. Measurements during Round 3 show a slightly different groundwater pattern at the site in which the highest groundwater elevation was measured in a monitoring well west of the former USTs. Generally, the groundwater flow is toward the north and east through the tank grave with some groundwater flowing west, with all of the groundwater eventually discharging into Narragansett Bay.

TABLE 4-4
GROUNDWATER VOCS AND SVOCS ANALYTICAL SUMMARY
BUILDING 44 GROUNDWATER MONITORING ROUNDS 1 THROUGH 3
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

Monitoring Well			MW204R (Upgradient)						MW001R (Source Area)						MW203R (Source Area)					
Round			1		2		3		1		2		3		1		2		3	
Date Sampled	GWQS	PAL	Apr 01		Oct 01		Apr 02		Apr 01		Oct 01		Apr 02		Apr 01		Oct 01		Apr 02	
Volatile Organic Analysis (UG/L)																				
2-Butanone			5	U	5	U	10	U	12	U	6		10	U	5	U	5	U	10	U
4-Methyl-2-Pentanone			5	U	5	U	10	U	3	J	2		2	J	5	U	5	U	10	U
Acetone			5	U	5	U	10	U	67	U	35		29	U	5	U	9	U	10	U
Toluene	1000	500	5	U	5	U	10	U	1	J	1		2	J	5	U	5	U	10	U
Semivolatile Organic Analysis (UG/L)																				
2,4,5-Trichlorophenol			20	U	20	U	20	U	1	J	180	U	20	U	20	U	20	U	20	U
2,4-Dichlorophenol			10	U	10	U	10	U	10	U	90	U	10	U	10	U	10	U	10	U
2,4-Dimethylphenol			10	U	10	U	10	U	8	J	16		8	J	10	U	10	U	10	U
2-Chloronaphthalene			10	U	10	U	10	U	10	U	90	U	10	U	10	U	10	U	10	U
2-Methylnaphthalene			10	U	3	J	10	U	1	J	90	U	2	J	2	J	10	U	10	U
2-Methylphenol			10	U	10	U	10	U	4	J	90	U	4	J	10	U	10	U	10	U
4-Methylphenol			10	U	1	J	10	U	36		71		33		10	U	10	U	10	U
Acenaphthene			3		6	J	10	U	4	J	90	U	5	J	8	J	10	U	1	J
Acenaphthylene			10	U	10	U	10	U	10	U	90	U	10	U	10	U	10	U	10	U
Anthracene			3		3	J	10	U	4	J	90	U	3	J	18		1	J	2	J
Benzo(a)anthracene			10	U	10	U	10	U	3	J	90	U	3	J	32		2	J	7	J
Benzo(a)pyrene	*0.2*	*0.1*	10	U	10	U	10	U	***3***	***J***	90	U	***3***	***J***	***26***		***1***	***J***	***7***	***J***
Benzo(b)fluoranthene			10	U	10	U	10	U	4	J	90	U	4	J	34		2	J	9	J
Benzo(g,h,i)perylene			10	U	10	U	10	U	10	U	90	U	2	J	15		10	U	4	J
Benzo(k)fluoranthene			10	U	10	U	10	U	1	J	90	U	1	J	12		10	U	4	J
bis(2-Ethylhexyl)phthalate	6	3	10	U	10	U	10	U	10	U	90	U	2	J	10	U	10	U	1	J
Carbazole			4		54	J	10	U	5	J	33		5	J	11		3	J	1	J
Chrysene			10	U	10	U	10	U	3	J	90	U	3	J	33		2	J	8	J
Dibenzo(a,h)anthracene			10	U	10	U	10	U	10	U	90	U	10	U	4	J	10	U	1	J
Dibenzofuran			1		4	J	10	U	2	J	90	U	2	J	5	J	10	U	10	U
Diethylphthalate			10	U	10	U	10	U	10	U	90	U	10	U	10	U	10	U	10	U
Fluoranthene			2		1	J	10	U	8	J	90	U	7	J	68		5	J	17	J
Fluorene			1		4	J	10	U	2	J	90	U	2	J	9	J	10	U	1	J
Indeno(1,2,3-cd)pyrene			10	U	10	U	10	U	2	J	90	U	2	J	16		10	U	4	J
Naphthalene	*20*	*10*	3		***22***		10	U	*11*		***22***		*15*		4	J	10	U	10	U
Pentachlorophenol	***1***	*0.5*	***6***		***1***	***J***	20	U	***34***		***77***		***30***		***4***	***J***	20	U	20	U
Phenanthrene			1		4	J	10	U	7	J	90	U	7	J	52		5	J	11	
Phenol			10	U	10	U	10	U	230	*J	980		280	*	10	U	10	U	10	U
Pyrene		–	2		10	U	10	U	7	J	90	U	6	J	59		4	J	15	J

Bold italics – GWQS exceeded; Italics – PAL exceeded; U – not detected; J – quantitation approximate; UJ – detection limit approximate

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TABLE 4-4 (cont.)
GROUNDWATER VOCS AND SVOCS ANALYTICAL SUMMARY
BUILDING 44 GROUNDWATER MONITORING ROUNDS 1 THROUGH 3
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Monitoring Well			MW205R (Source Area)						MW003R (Downgradient)				MW202R (Downgradient)			
Round			1		2		3		2		3		2		3	
Date Sampled	GWQS	PAL	Apr 01		Oct 01		Apr 02		Apr 01		Oct 01		Apr 01		Oct 01	
Volatile Organic Analysis (UG/L)																
2-Butanone			5	U	5	U	10	U	5	U	10	U	5	U	10	U
4-Methyl-2-Pentanone			5	U	5	U	10	U	5	U	10	U	5	U	10	U
Acetone			8	U	5	U	10	U	5	U	10	U	5	U	10	U
Toluene	1000	500	5	U	5	U	10	U	5	U	10	U	5	U	1	J
Semivolatile Organic Analysis (UG/L)																
2,4,5-Trichlorophenol			20	U	20	U	20	U	20	U	20	U	20	U	20	U
2,4-Dichlorophenol			10	U	1	J	10	U	10	U	10	U	10	U	10	U
2,4-Dimethylphenol			10	U	1	J	10	U	10	U	10	U	10	U	10	U
2-Chloronaphthalene			10	U	3	J	10	U	10	U	10	U	8	J	10	U
2-Methylnaphthalene			2	J	5	J	2	J	10	U	10	U	10	U	10	U
2-Methylphenol			10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-Methylphenol			10	U	10	U	10	U	10	U	10	U	10	U	10	U
Acenaphthene			6	J	9	J	4	J	10	U	10	U	1	J	10	U
Acenaphthylene			10	U	10	U	10	U	10	U	10	U	10	U	10	U
Anthracene			4	J	4	J	2	J	1	J	10	U	3	J	10	U
Benzo(a)anthracene			1	J	2	J	1	J	10	U	10	U	10	U	10	U
Benzo(a)pyrene	*0.2*	*0.1*	10	U	*1*	*J*	10	U	10	U	10	U	10	U	10	U
Benzo(b)fluoranthene			1	J	2	J	1	J	10	U	10	U	10	U	10	U
Benzo(g,h,i)perylene			10	U	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(k)fluoranthene			10	U	10	U	10	U	10	U	10	U	10	U	10	U
bis(2-Ethylhexyl)phthalate	6	3	10	U	10	U	2	J	10	U	10	U	10	U	1	J
Carbazole			4	J	36	J	4	J	3	J	10	U	18	J	5	J
Chrysene			1	J	2	J	1	J	10	U	10	U	10	U	10	U
Dibenzo(a,h)anthracene			10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dibenzofuran			4	J	6	J	3	J	10	U	10	U	3	J	1	J
Diethylphthalate			1	J	2	J	10	U	10	U	10	U	10	U	10	U
Fluoranthene			4	J	5	J	3	J	10	U	10	U	10	U	1	J
Fluorene			2	J	7	J	3	J	10	U	10	U	3	J	2	J
Indeno(1,2,3-cd)pyrene			10	U	10	U	10	U	10	U	10	U	10	U	10	U
Naphthalene	*20*	*10*	5	J	***24***		***12***		4	J	10	U	1	J	9	J
Pentachlorophenol	*1*	*0.5*	***16***	***J***	*3*	*J*	*2*	*J*	*4*	*J*	*3*		20	U	20	U
Phenanthrene			1	J	5	J	6	J	10	U	10	U	10	U	10	U
Phenol			10	U	10	U	10	U	10	U	10	U	10	U	10	U
Pyrene			3	J	4	J	2	J	10	U	10	U	10	U	1	J

Bold italics – GWQS exceeded; Italics – PAL exceeded; U – not detected; J – quantitation approximate; UJ – detection limit approximate

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TABLE 4-4 (cont.)
GROUNDWATER VOCS AND SVOCS ANALYTICAL SUMMARY
BUILDING 44 GROUNDWATER MONITORING ROUNDS 1 THROUGH 3
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
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Monitoring Well			MW207 (Downgradient)					
Round			1		2		3	
Date Sampled	GWQS	PAL	Apr 01		Oct 01		Apr 02	
Volatile Organic Analysis (UG/L)								
2-Butanone			5	U	5	U	10	U
4-Methyl-2-Pentanone			5	U	5	U	10	U
Acetone			5	U	5	U	10	U
Toluene	1000	500	5	U	5	U	10	U
Semivolatile Organic Analysis (UG/L)								
2,4,5-Trichlorophenol			20	U	20	U	20	U
2,4-Dichlorophenol			10	U	10	U	10	U
2,4-Dimethylphenol			10	U	10	U	10	U
2-Chloronaphthalene			10	U	1	J	10	U
2-Methylnaphthalene			10	U	10	U	10	U
2-Methylphenol			10	U	10	U	10	U
4-Methylphenol			10	U	10	U	10	U
Acenaphthene			10	U	3	J	20	
Acenaphthylene			10	U	10	U	1	J
Anthracene			10	U	2	J	2	J
Benzo(a)anthracene			10	U	2	J	8	J
Benzo(a)pyrene	*0.2*	*0.1*	10	U	***1***	***J***	***9***	***J***
Benzo(b)fluoranthene			10	U	2	J	13	
Benzo(g,h,i)perylene			10	U	10	U	6	J
Benzo(k)fluoranthene			10	U	10	U	5	J
bis(2-Ethylhexyl)phthalate	6	3	10	U	10	U	10	U
Carbazole			10	U	10	J	7	J
Chrysene			10	U	2	J	11	
Dibenzo(a,h)anthracene			10	U	10	U	10	U
Dibenzofuran			10	U	3	J	8	J
Diethylphthalate			10	U	10	U	10	U
Fluoranthene			1	J	6	J	22	
Fluorene			10	U	2	J	5	J
Indeno(1,2,3-cd)pyrene			10	U	10	U	6	J
Naphthalene	*20*	*10*	10	U	10	U	***39***	
Pentachlorophenol	*1*	*0.5*	20	U	20	U	20	U
Phenanthrene			10	U	4	J	13	
Phenol			10	U	10	U	10	U
Pyrene			10	U	4	J	19	

Bold italics – GWQS exceeded; Italics – PAL exceeded; U – not detected; J – quantitation approximate; UJ – detection limit approximate

TABLE 4-5
GROUNDWATER GRO, DRO-TPH AND METALS ANALYTICAL SUMMARY
BUILDING 44 GROUNDWATER MONITORING ROUNDS 1 THROUGH 3
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
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Monitoring Well			MW204R (Upgradient)						MW001R (Source Area)						MW203R (Source Area)					
Round			1		2		3		1		2		3		1		2		3	
Date Sampled	GWQS	PAL	Apr 01		Oct 01		Apr 02		Apr 01		Oct 01		Apr 02		Apr 01		Oct 01		Apr 02	
Gasoline Range Organic Analysis (UG/L)																				
Gasoline Range Organics			250	U	250	U	50	U	250	U	250	U	57		250	U	250	U	50	U
Total Petroleum Hydrocarbon Analysis (MG/L)																				
Total Petroleum Hydrocarbons			2.0		1.5		0.69		6.2		5.5		3.5		20		2.2		3.4	
TAL Metal Analysis (UG/L)																				
Arsenic	50	25	3.8		6.4	U	3.0	U	14.5		8.3	U	4.3	J	9.9		11.5	U	9.1	
Barium	2000	1000	70.0	U	57.7		67.9		144	U	177		111		250		162		225	
Cadmium	***5***	2.5	0.88	U	0.56	U	2.0	U	4.1	U	2.6	U	2.0	U	2.3	U	2.4	U	2.0	U
Chromium	100	50	5.6	U	2.4	U	3.7	UJ	11.3	U	8.8		4.8	UJ	6.5	U	1.6	U	35.2	
Lead	***15***	7.5	***16.0***		2.0	U	***29.7***		***278***		***230***		***135***		***123***		2.0	U	***45.9***	
Mercury	***2***	1	0.14	U	0.14	U	***2.1***		1.0		0.42		0.40		0.13	U	0.14	U	0.14	U
Dissolved Metal Analysis (UG/L)																				
Arsenic	50	25	2.6		4.8	U	3.0	U	7.9		7.2	U	3.7	J	6.2		10.7	U	3.0	U
Barium	2000	1000	41.9	U	60.1		53.5		84.6	UJ	82.8		67		169	UJ	152		89.0	
Chromium	100	50	1.8	U	2.3	U	3.0	U	0.61	UJ	0.86	U	3.0	U	0.91	UJ	2.0	U	3.0	U
Lead	***15***	7.5	2.0	U	2.0	U	2.6		***37.0***		***15.2***		6.8		2.0	U	2.0	U	1.0	U
Mercury	2	1	0.13	U	0.16	U	0.14	U	0.15	J	0.36		0.14	U	0.13	U	0.15	U	0.13	U
Silver			1.0	U	1.0	U	2.3	J	1.0	UJ	1.0	U	2.0	U	1.0	UJ	1.0	U	2.2	J

Bold italics – GWQS exceeded; Italics – PAL exceeded; U – not detected; J – quantitation approximate; UJ – detection limit approximate

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TABLE 4-5 (cont.)
GROUNDWATER GRO, DRO-TPH AND METALS ANALYTICAL SUMMARY
BUILDING 44 GROUNDWATER MONITORING ROUNDS 1 THROUGH 3
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
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Monitoring Well			MW205R (Source Area)						MW003R (Downgradient)				MW202R (Downgradient)			
Round			1		2		3		2		3		2		3	
Date Sampled	GWQS	PAL	Apr 01		Oct 01		Apr 02		Apr 01		Oct 01		Apr 01		Oct 01	
Gasoline Range Organic Analysis (UG/L)																
Gasoline Range Organics			250	U	250	U	50	U	250	U	50	U	250	U	140	
Total Petroleum Hydrocarbon Analysis (MG/L)																
Total Petroleum Hydrocarbons			2.1		2.3		1.4		2.1		0.76		2.1		3.4	
TAL Metal Analysis (UG/L)																
Arsenic	50	25	5.9		5.2	U	3.0	U	24.3		11.9		7.7	U	3.0	U
Barium	2000	1000	31.9	U	58.6	U	43.4		166		107		119		92.9	
Cadmium	*5*	2.5	0.40	U	0.40	U	2.0	U	4.3		2.0	U	***5.6***		2.0	U
Chromium	100	50	6.9	U	5.6		3.6	UJ	57.3		34.0		17.0		3.0	U
Lead	*15*	7.5	4.0	U	2.0	U	8.5		***30.6***		***26.6***		6.8		12.8	
Mercury	2	1	0.13	U	0.15	U	0.16	UJ	0.14	U	0.16	U	0.14	U	0.13	U
Dissolved Metal Analysis (UG/L)																
Arsenic	50	25	5.4		6.1	U	3.0	U	5.0	U	3.4		2.0	U	3.0	U
Barium	2000	1000	29.2	UJ	58.6		40.0	U	51.1		25.4	U	89.5		66.7	
Chromium	100	50	3.2	UJ	5.5		3.2	J	2.4	U	3.0	U	1.3	U	3.0	U
Lead	*15*	7.5	2.0	U	2.0	U	1.9	J	2.0	U	1.0	U	2.0	U	1.0	U
Mercury	2	1	0.13	U	0.14	U	0.13	U	0.13	U	0.14	U	0.15	U	0.14	U
Silver			1.0	UJ	1.0	U	2.0	U	1.0	U	2.0	U	1.0	U	2.0	U

Bold italics – GWQS exceeded; Italics – PAL exceeded; U – not detected; J – quantitation approximate; UJ – detection limit approximate

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TABLE 4-5 (cont.)
GROUNDWATER GRO, DRO-TPH AND METALS ANALYTICAL SUMMARY
BUILDING 44 GROUNDWATER MONITORING ROUNDS 1 THROUGH 3
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
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Monitoring Well			MW207 (Downgradient)					
Round			1		2		3	
Date Sampled	GWQS	PAL	Apr 01		Oct 01		Apr 02	
Gasoline Range Organic Analysis (UG/L)								
Gasoline Range Organics			250	U	250	U	50	U
Total Petroleum Hydrocarbon Analysis (MG/L)								
Total Petroleum Hydrocarbons			2.2		2.0		2.7	
TAL Metal Analysis (UG/L)								
Arsenic	50	25	2.0	U	9.8	U	11.9	
Barium	2000	1000	93.2	U	230		364	
Cadmium	**5**	2.5	0.53	UJ	3.3		4.5	
Chromium	100	50	0.91	UJ	3.8	U	18.4	U
Lead	***15***	7.5	13.1		***256***		***1380***	
Mercury	**2**	1	0.14	U	0.14	U	0.48	
Dissolved Metal Analysis (UG/L)								
Arsenic	50	25	2.0	J	9.3	U	3.0	U
Barium	2000	1000	85.6	UJ	185		133	
Chromium	100	50	0.50	UJ	0.99	UJ	3.0	U
Lead	***15***	7.5	2.0	U	2.0	U	1.0	
Mercury	2	1	0.13	U	0.14	U	0.13	U
Silver			1.0	UJ	1.0	U	2.0	U

Bold italics – GWQS exceeded; Italics – PAL exceeded; U – not detected; J – quantitation approximate; UJ – detection limit approximate

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Based on three rounds of groundwater monitoring, it appears that the tank closure and corrective action activities were successful in removing most petroleum-related contamination at the former USTs. No free product was observed in these rounds, therefore product recovery efforts are not necessary. The analytical results indicate that low-level residual petroleum in the subsurface is potentially being released to the groundwater, based on the detection of low-level DRO-TPH in all monitoring wells.

However, even though the soil removal has resulted in a decrease in petroleum-related groundwater contamination, six contaminants were found at levels exceeding the (GWQS) for GA areas. The observed changes in these concentrations occurred after the removal of the USTs at Building 44 and placement of demolition debris backfill in the UST excavation. These six contaminants consist of three SVOCs (benzo(a)pyrene, naphthalene, and pentachlorophenol) and three metals (cadmium, lead, and mercury).

Based on the above findings, it was recommended that three additional semi-annual sampling rounds be conducted, and that they include the same designated wells sampled in Rounds 2 and 3.

4.4 BUILDING 32 UNDERGROUND STORAGE TANK (UST) SITE INVESTIGATION REPORT (B&RE, 1997)

A UST Site Investigation Report describes tank closure and related investigative activities conducted at Building 32 by Brown & Root Environmental (B&RE, 1997). A 1,000-gallon steel UST containing No. 2 fuel oil was removed from the south of Building 32 in July 1997 (Figure 4-1). The investigation included soil borings and installation of 3 groundwater monitoring wells. Soil samples from the soil borings were analyzed for TPH. A summary of chemical results from samples collected during this effort is presented in Tables 4-6 and 4-7.

No TPH concentrations were identified exceeding RIDEM residential Direct Exposure Criteria (500 mg/kg) or exceeding RIDEM Industrial/Commercial Direct Exposure Criteria (2,500 mg/kg). Positive detections ranged from 37 mg/kg for SB16 to 260 mg/kg for sample TNK-W.

Results from groundwater samples collected from the three wells and one groundwater sample collected from the tank grave (TNK-AQ) were submitted for TPH, VOCs, SVOCs, and RCRA metals. TPH was identified in the sample from MW303 at 1.1 mg/L. TPH was not identified in the samples from MW301, MW302, and TNK-AQ. One volatile organic compound was identified at a level above the RIDEM Groundwater Objective for GA areas in the sample obtained from MW301. For this sample, trichloroethene was identified at 6 ug/L, exceeding the GA Groundwater Objective of 5 ug/L. No other VOCs were identified at levels in excess of the RIDEM Groundwater Objective for GA areas. No SVOCs or metals were identified at levels in excess of the RIDEM Groundwater Objective for GA areas.

TABLE 4-6
SOIL SAMPLE DATA SUMMARY
BUILDING 32 TANK CLOSURE ASSESSMENT
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

SAMPLE IDENTIFICATION NO.	TNK-E	TNK-W	SB16-0305	SB17-0305	RIDEM DIRECT EXPOSURE CRITERIA (1)	
					RES(2)	IND/COM(3)
SAMPLE MEDIUM	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**mg/kg**	**Mg/kg**
PARAMETERS (mg/kg)						
Total Petroleum Hydrocarbons	140	260	37	ND	500	2500
Gasoline Range Organics	2.9	NA	ND	ND	-	-

Notes:
1) Rhode Island Department of Environmental Protection Remediation Regulations – March 31, 1993; Amended August 1996
2) RES is the Residential Direct Exposure Criterion
3) IND/COM is the Industrial/Commercial Direct Exposure Criterion
J - Estimated value
ND - Not detected
NA - Not Analyzed

TABLE 4-7
GROUNDWATER SAMPLE DATA SUMMARY
BUILDING 32 TANK CLOSURE ASSESSMENT
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

SAMPLE IDENTIFICATION NO.	TNK-AQ	MW301	MW302	MW303	GA GROUNDWATER OBJECTIVE[1]
SAMPLE MEDIUM	**AQ**	**AQ**	**AQ**	**AQ**	**ug/L**
PARAMETERS (mg/L)					
Total Petroleum Hydrocarbons	ND	ND	ND	1.1	-
TCL VOCs (ug/L)					
Methylene Chloride	NA	0.8J	1	4	5
Acetone	NA	6	5J	8	-
cis-1,2-Dichloroethene	NA	10	1J	ND	70
trans-1,2-Dichloroethene	NA	4	ND	ND	100
Chloroform	NA	0.7J	ND	0.9J	100[2]
Trichloroethene	NA	6	ND	0.8J	5
Toluene	NA	ND	5	ND	1000
Ethylbenzene	NA	ND	2	ND	700
Total Xylenes	NA	ND	8	ND	10000
TCL SVOCs (ug/L)					
Bis(2-ethylhexyl)phthalate	NA	12	6J	32	-
INORGANICS (ug/L)					
Arsenic	NA	5.6	2.3	ND	-
Barium	NA	44.8	64.8	106	2000
Cadmium	NA	0.29	ND	0.55	5
Chromium	NA	9.9	14.6	5.2	100
Lead	NA	8.5	4.0	6.5	15
Mercury	NA	0.01	ND	ND	2

Notes:

1) Rhode Island Department of Environmental Protection Remediation Regulations – March 31, 1993; Amended August 1996.
2) Total Trihalomethanes GA Groundwater Objective
3) IND/COM is the Industrial/Commercial Direct Exposure Criterion

J - Estimated value
ND - Not Detected
NA - Not Analyzed

4.5 STUDY AREA SCREENING EVALUATION (SASE) FOR BUILDING 32 (TtNUS, 2000)

The SASE was performed to determine the presence of any environmental contamination, and to determine if the site conditions warrant a Remedial Investigation (RI). The SASE was conducted in the early months of 2000, and a single draft report was prepared. The SASE included:

- Building 32 Interior Survey, Inspection, and Onshore Survey
- Soil Gas Sampling
- Concrete Sample Collection
- Drain Investigation
- Surface Soil Sampling

The results of the soil gas survey are presented in Appendix B. The analytical results from the concrete, drain residue, and soil sampling are presented in Tables 4-8A, 4-8B, and 4-8C, respectively.

Results of soil gas sampling indicated the possible presence of trichloroethene, naphthalene and diesel range organic compounds in most of the soil gas detectors installed. The extent of the detections presented in the graphic plots showed relative high and low values detected. These plots indicated that soil gas with these contaminants appeared to be captured under the slab foundation of Building 32. However, relative high concentrations of TCE were focused under the northwest corner of the building, and relative low concentrations were present under the rest of the building footprint. This supports the findings of the adjacent soil gas investigation conducted by the Quad Three Group (section 4.3.2 of this report) which reported indications of TCE contamination in the ground with relative high concentrations at the northwest portion of Building 32. Petroleum hydrocarbons were detected in soil gas with relative high concentrations outside the northwest corner of the building, which is consistent with the presence of petroleum associated with the Building 44 releases (Section 4.3 of this report). Naphthalene was present in soil gas throughout the building footprint, without apparent "hot spots".

Results from analysis of concrete chip samples and residue from floor drains indicated the presence of traces of volatile organic compounds including TCE, benzene, toluene, and xylene. Semivolatile organic compounds were detected in some samples at low concentrations, however, some samples had high detection limits. A trace of one PCB compound was detected in one sample (0.3 mg/kg) in the electroplating room. Elevated concentrations of metals were detected in concrete samples from the drainage trenches in the electroplating room, including copper (699 mg/kg), cadmium (482 mg/kg) chromium (2,720 mg/kg), and cyanide (24 mg/kg).

Analytical results from drain residue samples reported VOCs, SVOCs, and metals. Primarily of note was the presence of toluene at a concentration of 7,700 ug/kg, and trichloroethene, detected at 250 ug/kg. The trichloroethene concentrations were highest in the pits beneath the east and west solvent tanks. Semivolatile organic compounds in the drain residue samples were dominated by the presence of PAH compounds, particularly in the electroplating room. Metals in the floor drain residue samples were dominated by iron and zinc, although cyanide, cadmium and copper were detected at high concentrations in the samples taken from the electroplating room.

Results from surface soil samples indicated the presence of PAH compounds and metals exceeding the Rhode Island Direct Exposure Criteria for residential soils.

TABLE 4-8a
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN CONCRETE SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

Sample Number	G32-CO-01-03IN		G32-CO-02-03IN		G32-CO-03-03IN		G32-CO-04-03IN		G32-CO-05-03IN		G32-CO-06-03IN		G32-CO-07-03IN		G32-CO-08-03IN		G32-DUP1	
Date Sampled	4/18/00		4/18/00		4/18/00		4/18/00		4/18/00		4/26/00		4/27/00		4/27/00		4/18/00	
QC Identifier	None		None		None		None		Field Dup. G32-CO-05-03IN		None		None		None		Field Dup. G32-CO-05-03IN	
Matrix	Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust	
Percent Solids	90.2		94		97.8		96.4		95		96.3		93.4		93.2		96.5	
Volatile Organic Analysis (UG/KG)																		
2-Butanone	38		17		19	U	6.0	J	14	U	11	UJ	12	UJ	20	J	14	U
2-Hexanone	14		15	U	19	U	18	U	14	U	11	UJ	12	UJ	15	UJ	14	U
4-Methyl-2-Pentanone	9.0	J	15	U	19	U	5.0	J	14	U	11	U	12	U	15	U	14	U
Acetone	67	J	40	J	24	J	27	J	21	J	31	J	24	J	53	J	23	J
Benzene	2.0	J	15	U	19	U	18	U	14	U	11	U	12	U	15	U	14	U
Carbon Disulfide	5.0	J	3.0	J	19	U	18	U	14	U	11	U	12	U	15	U	14	U
Ethylbenzene	2.0	J	15	U	19	U	18	U	14	U	11	U	12	U	15	U	14	U
Isopropylbenzene	12	U	15	U	6.0	J	18	U	14	U	11	U	12	U	2.0	J	14	U
Methylcyclohexane	12	U	15	U	19	U	18	U	14	U	11	U	12	U	15	U	14	U
Methylene Chloride	12	U	15	U	19	U	18	U	14	U	11	U	12	U	2.0	J	14	U
Toluene	7.0	J	2.0	J	19	U	18	U	14	U	8.0	J	4.0	J	6.0	J	14	U
Total Xylenes	11	J	4.0	J	9.0	J	18	U	14	U	11	U	12	U	7.0	J	14	U
Trichloroethene	3.0	J	15	U	19	U	18	U	14	U	11	U	3.0	J	10	J	14	U
													12	U	15	U	14	U
Semivolatile Organic Analysis (UG/KG)																		
1,1'-Biphenyl	17000	U	11000	U	11000	U	370	U	370	U	43	J	360	U	11000	U	370	U
2-Methylnaphthalene	17000	U	11000	UJ	11000	U	370	U	370	U	150	J	360	U	11000	U	370	U
Anthracene	17000	U	11000	U	11000	U	370	U	370	U	360	U	360	U	11000	U	31	J
Benzo(a)anthracene	4000	J	11000	U	11000	U	56	J	39	J	51	J	55	J	11000	U	80	J
Benzo(a)pyrene	3500	J	11000	U	11000	U	43	J	370	U	57	J	54	J	11000	U	73	J
Benzo(b)fluoranthene	3800	J	11000	U	11000	U	50	J	33	J	55	J	49	J	11000	U	85	J
Benzo(g,h,i)perylene	17000	UJ	11000	U	11000	UJ	31	J	16	J	360	U	360	U	11000	UJ	36	J
Benzo(k)fluoranthene	3600	J	11000	U	11000	U	54	J	37	J	54	J	47	J	11000	U	81	J
bis(2-Ethylhexyl)phthalate	17000	U	11000	U	11000	U	370	U	38	J	360	U	360	U	11000	U	29	J
Chrysene	4300	J	11000	U	11000	U	71	J	52	J	72	J	67	J	11000	U	110	J
Di-n-Butylphthalate	17000	U	11000	U	11000	U	34	J	370	U	41	J	17000	D	11000	U	54	J
Fluoranthene	9100	J	11000	U	920	J	130	J	100	J	130	J	130		11000	U	210	J
Indeno(1,2,3-cd)pyrene	17000	U	11000	U	11000	U	28	J	370	U	360	U	360	U	11000	UJ	33	J
N-Nitroso-diphenylamine	17000	U	11000	U	11000	U	370	U	370	U	360	U	56	J	11000	U	370	U
Phenanthrene	3700	J	11000	U	11000	U	98	J	56	J	88	J	85	J	11000	U	160	J
Pyrene	7600	J	11000	U	1200	J	110	J	80	J	91	J	110	J	11000	U	160	J

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

TABLE 4-8a (cont.)
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN CONCRETE SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND
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Sample Number	G32-CO-01-03IN		G32-CO-02-03IN		G32-CO-03-03IN		G32-CO-04-03IN		G32-CO-05-03IN		G32-CO-06-03IN		G32-CO-07-03IN		G32-CO-08-03IN		G32-DUP1	
Date Sampled	4/18/00		4/18/00		4/18/00		4/18/00		4/18/00		4/26/00		4/27/00		4/27/00		4/18/00	
QC Identifier	None		None		None		None		Field Dup. G32-CO-05-03IN		None		None		None		Field Dup. G32-CO-05-03IN	
Matrix	Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust		Concrete Dust	
Percent Solids	90.2		94		97.8		96.4		95		96.3		93.4		93.2		96.5	
Pesticide/PCB Analysis (UG/KG)																		
4,4'-DDT	22	U	24	U	22	U	5.4		7.2		3.6	U	4.1		22	U	4.9	
Aroclor-1254	220	U	240	U	220	U	34	U	320	J	36	U	37	U	220	U	36	UJ
Heptachlor Epoxide	11	U	12	U	11	U	1.7	U	2.3	J	1.8	U	1.8	U	11	U	1.8	UJ
Gasoline Range Organic Analysis (MG/KG)																		
Gasoline Range Organics	0.354		0.28	U	0.528		0.22	U	0.27	UJ	0.21	U	0.23	U	0.25	U	0.27	U
Diesel Range Organic Analysis (MG/KG)																		
Diesel Range Organics	17900		21800		13300		44.1		14.1	J	310		71.2		2420		70.8	J
TAL Metal Analysis (MG/KG)																		
Aluminum	3070		3310		3590		8580		9280		6880		7860		3400		8250	
Antimony	7.7	J	6.4	J	11.4	J	0.52	UJ	0.53	UJ		R	2.1	UJ	3.6	UJ	0.52	UJ
Arsenic	1.6	UJ	3.3	UJ	7.6	J	3.5	UJ	3.8	J	6.3	J	2.9	J	2.5	J	3.3	UJ
Barium	225		76.0		326		181		96.4		90.8	J	282		211		202	
Cadmium	451	J	40.1	J	482	J	8.2	J	18.4	J	20.2	J	2.9	UJ	4.9	J	10.7	J
Calcium	4980		3680		13400		50000		52100		49400		69800		11300		48700	
Chromium	48.1		2720		70.1	J	16.9		15.1		15.8		20.2		16.8		19.9	
Cobalt	4.0		3.7		7.5		5.7		5.9		5.6	J	5.4	J	3.9		6.2	
Copper	840	J	699	J	275	J	38.6	J	12.4	J	1060	J	102	J	45.4	J	53.1	J
Cyanide	23.8		0.53	U	2.9		0.52	U	0.53	U	0.52	U	0.54	U	0.54	U	0.52	U
Iron	15900		15200		63500		17700		16300		21000		16700		11200		19400	
Lead	598	J	526	J	650	J	183	J	40.5	J	246	J	245	J	377	J	275	J
Magnesium	1670		1630		1630		3870		3700		2850		3500		1650		4040	
Manganese	198	J	192	J	423	J	305	J	301	J	301	J	279	J	196	J	288	J
Mercury	0.09	UJ	0.16		0.06	UJ	0.02	U	0.02	U	0.07	U	0.05	U	0.08	U	0.02	UJ
Nickel	369	J	44.4	J	87.8	J	11.2	J	12.0	J	22.9	J	12.6	J	15.3	J	12.8	J
Potassium	794		987		867	J	2470		1160		2230	J	1690	J	585		2520	
Selenium	0.84	U	0.81	U		R	1.2	J	1.6	J	0.79	UJ	0.81	UJ	0.82	UJ	1.8	J
Silver	1.9		2.1		0.51	J	4.1		0.62		0.58		0.63		0.91		1.5	
Sodium	650		878		394	UJ	1680		79.7	U	1340		426		177	U	1800	
Vanadium	40.4		54.3		50.0		11.1		12.3		12.4	J	10.1	J	38.3		10.6	
Zinc	521	J	293	J	513	J	83.7	J	810	J	687	J	339	J	366	J	115	J

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

TABLE 4-8b
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN DRAIN RESIDUE SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

Sample Number	G32-DR-01		G32-DR-02		G32-DR-03		G32-DR-04		G32-DR-05		G32-DR-06		G32-DR-07		G32-DR-08		G32-DR-09	
Date Sampled	4/24/00		4/24/00		4/24/00		4/24/00		4/24/00		4/24/00		4/25/00		4/25/00		4/26/00	
QC Identifier	None		Field Dup. G32-DR-02		None		None		None		None		None		None		None	
Matrix	Drain		Drain		Drain		Drain		Drain		Drain		Drain		Drain		Drain	
Percent Solids	66.5		59.5		58.6		81.9		62.2		75.9		21.1		27.9		11.1	
Volatile Organic Analysis (UG/KG)																		
2-Butanone	14	U	70		33		37	J	26	J	11	U	70	UJ	29	J	140	UJ
Acetone	97	J	290	J	170	J	110	J	170	J	38	J	210	J	73	J	210	J
Benzene	14	U	18	U	3.0	J	6.0	J	16	U	11	U	70	U	34	U	140	U
Carbon Disulfide	14	U	18	U	18	U	11	UJ	3.0	J	11	U	150		34	U	32	J
Chloroethane	14	U	6.0	J	18	U	11	UJ	4.0	J	11	U	70	U	34	U	140	U
Chloromethane	14	U	21		18	U	11	UJ	7.0	J	11	U	70	U	34	U	140	U
cis-1,2-Dichloroethene	14	U	18	U	18	U	11	UJ	16	U	11	U	11	J	28	J	140	U
Ethylbenzene	14	U	18	U	18	U	11	UJ	16	U	11	U	70	U	34	U	140	U
Isopropylbenzene	14	U	18	U	18	U	11	UJ	16	U	11	U	70	U	34	U	140	U
Methylcyclohexane	14	U	18	U	18	U	11	UJ	16	U	11	U	70	U	34	U	140	U
Methylene Chloride	3.0	J	2.0	J	18	U	11	UJ	6.0	J	2.0	J	12	J	7.0	J	150	
Tetrachloroethene	14	U	18	U	18	U	11	UJ	16	U	11	U	70	U	34	U	140	U
Toluene	14	U	18	U	2.0	J	1.0	J	16	U	11	U	70	U	34	U	140	U
Total Xylenes	14	U	18	U	18	U	11	UJ	16	U	11	U	70	U	34	U	140	U
trans-1,2-Dichloroethene	14	U	18	U	18	U	11	UJ	16	U	11	U	70	U	34	J	140	U
Trichloroethene	14	U	18	U	5.0	J	48	J	16	U	11	U	250		69		140	U
Vinyl Chloride	14	U	18	U	18	U	11	UJ	16	U	11	U	70	U	34	U	140	U
Semivolatile Organic Analysis (UG/KG)																		
1,1'-Biphenyl	5100	U	5800	U	6100	U	4100	U	820	J	4500	U	1500	UJ	1200	UJ	5200	J
2,4-Dimethylphenol	5100	U	5800	U	6100	U	4100	U	5300	U	4500	U	1500	UJ	1200	UJ	1300	J
2-Methylnaphthalene	5100	U	5800	U	1300	J	4100	U	2400	J	4500	U	1500	UJ	1200	UJ	18000	J
Acenaphthene	3100	J	5800	U	6200		750	J	9700		4500	U	1500	UJ	1200	UJ	71000	*J
Acenaphthylene	5100	U	5800	U	6100	U	4100	U	1800	J	4500	U	1500	UJ	1200	UJ	39000	J
Anthracene	6000		1000	J	10000		2200	J	57000	*	4500	U	170	J	1200	UJ	220000	*J
Benzaldehyde	5100	U	5800	U	6100	U	4100	U	5300	U	1700	J	1500	UJ	1200	UJ	5800	UJ
Benzo(a)anthracene	18000		2900	J	19000		7600		220000	*	700	J	460	J	1200	UJ	620000	*J
Benzo(a)pyrene	19000		3200	J	17000		6200		150000	*	600	J	320	J	1200	UJ	490000	*J
Benzo(b)fluoranthene	21000		4000	J	17000		6200		150000	*	590	J	270	J	1200	UJ	370000	*J

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed; ND Not Detected (aqueous samples, see Appendix A)

DRAFT

TABLE 4-8b (cont.)
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN DRAIN RESIDUE SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND
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Sample Number	G32-DR-01		G32-DR-02		G32-DR-03		G32-DR-04		G32-DR-05		G32-DR-06		G32-DR-07		G32-DR-08		G32-DR-09	
Date Sampled	4/24/00		4/24/00		4/24/00		4/24/00		4/24/00		4/24/00		4/25/00		4/25/00		4/26/00	
QC Identifier	None		Field Dup. G32-DR-02		None		None		None		None		None		None		None	
Matrix	Drain		Drain		Drain		Drain		Drain		Drain		Drain		Drain		Drain	
Percent Solids	66.5		59.5		58.6		81.9		62.2		75.9		21.1		27.9		11.1	
Benzo(g,h,i)perylene	9700		720	J	5500	J	2300	J	27000		4500	U	1500	UJ	1200	UJ	170000	*J
Benzo(k)fluoranthene	16000		3300	J	16000		7000		140000	*	710	J	320	J	1200	UJ	400000	*J
bis(2-Ethylhexyl)phthalate	7900		5800	U	3900	*	520	J	5300	U	160000	*	1500	UJ	1200	UJ	51000	j
Carbazole	5200		590	J	6100		1400	J	36000		4500	U	1500	UJ	1200	UJ	61000	*J
Chrysene	20000		4100	J	20000		8300		230000	*	1100	J	480	J	1200	UJ	520000	*J
Di-n-Butylphthalate	1100	J	5800	U	6500		4100	U	5300	U	4500	U	1500	UJ	1200	UJ	5800	UJ
Dibenzo(a,h)anthracene	4600	J	5800	U	2900	J	1200	J	17000		4500	U	1500	UJ	1200	UJ	38000	J
Dibenzofuran	1400	J	5800	U	2800	J	540	J	9800		4500	U	1500	UJ	1200	UJ	38000	*J
Fluoranthene	51000	D	7600		53000	*	22000		550000	*	1700	J	1200	J	1200	UJ	1500000	*J
Fluorene	2100	J	5800	U	4600	J	680	J	12000		4500	U	1500	UJ	1200	UJ	5800	UJ
Indeno(1,2,3-cd)pyrene	10000		770	J	5100	J	2400	J	32000		4500	U	1500	UJ	1200	UJ	190000	*J
Naphthalene	1000	J	5800	U	2600	J	770	J	4100	J	4500	U	1500	UJ	1200	UJ	39000	*J
Phenanthrene	34000		6000		51000	*	12000		26000	*	810	J	780	J	1200	UJ	600000	*J
Pyrene	40000		6800		45000	*	17000		470000	*	1400	J	1000	J	1200	UJ	1200000	*J
Pesticide/PCB Analysis (UG/KG)																		
4,4'-DDD	4.9	U	5.9	U	5.7	U	8.9		5.5	U	18		17	UJ	12	UJ	32	UJ
4,4'-DDE	260	*	61	J	13		30		5.5	U	43		17	UJ	12	UJ	32	UJ
4,4'-DDT	200	*	230	*J	72		82	*	5.5	U	55		24	J	12	UJ	32	UJ
alpha-Chlordane	2.4	U	2.9	U	2.8	U	27	J	2.8	U	2.3	U	8.3	UJ	5.9	UJ	16	UJ
Aroclor-1248	1200	*	59	U	57	U	43	U	55	U	46	U	170	UJ	120	UJ	320	UJ
Aroclor-1254	49	U	1400	J	150		340		55	U	320		170	UJ	120	UJ	320	UJ
Aroclor-1260	49	U	1100	J	57	U	43	U	55	U	46	U	170	UJ	120	UJ	320	UJ
Dieldrin	28		17	J	5.7	U	4.3	U	5.5	U	8.7		17	UJ	12	UJ	32	UJ
Endosulfan II	4.9	U	5.9	U	6.0		4.3	U	5.5	U	4.6	U	17	UJ	12	UJ	32	UJ
gamma-Chlordane	2.4	U	2.9	U	2.8	U	18	J	2.8	U	2.3	U	8.3	UJ	5.9	UJ	16	UJ
Gasoline Range Organic Analysis (MG/KG)																		
Gasoline Range Organics	0.52		0.36	UJ	0.31	UJ	0.282	J	0.424		0.275		3.34	J	0.20	U	2.3	UJ

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed; ND Not Detected (aqueous samples, see Appendix A)

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TABLE 4-8b (cont.)
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN DRAIN RESIDUE SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

Sample Number	G32-DR-01		G32-DR-02		G32-DR-03		G32-DR-04		G32-DR-05		G32-DR-06		G32-DR-07		G32-DR-08		G32-DR-09	
Date Sampled	4/24/00		4/24/00		4/24/00		4/24/00		4/24/00		4/24/00		4/25/00		4/25/00		4/26/00	
QC Identifier	None		Field Dup. G32-DR-02		None		None		None		None		None		None		None	
Matrix	Drain		Drain		Drain		Drain		Drain		Drain		Drain		Drain		Drain	
Percent Solids	66.5		59.5		58.6		81.9		62.2		75.9		21.1		27.9		11.1	
Diesel Range Organic Analysis (MG/KG)																		
Diesel Range Organics	1490		17900	J	1350	J	690		7720		320		35.1	J	98.5	J	12900	J
TAL Metal Analysis (MG/KG)																		
Aluminum	3230	J	3140	J	1100	J	1070	J	1010	J	352	J	996	J	1170	J	1710	J
Antimony	95.8	J		R	541	J	103	J	2100		166	J	63.9	J		R		R
Arsenic	10.3	J	18.5	J	29.8	J	41.7	J	40.4	J	9.5	J	22.2	J	29.8	J	10.5	J
Barium	1250		1340		1640	J	702	J	6090		419	J	1120	J	1150	J	230	J
Beryllium	1.1		0.15	UJ	0.13	UJ	0.76	U	0.10	U	0.08	U		R	0.22	UJ		R
Cadmium	201		95.2	J	1140		4540		435	J	56900		230	J	106	J	73.6	J
Calcium	21500	J	15300	J	8400	J	10200	J	7510	J	3480	J	8470	J	5190	J	15300	J
Chromium	149		219		1460		495		600		11800		149	J	103	J	226	J
Cobalt	16.9	J	17.4	J	36.6	J	35.6	J	48.7	J	22.5	J	17.7	J	21.8	J	13.2	J
Copper	1300		2320		24700		1390	J	1050	J	9540		931	J	1680	J	2160	J
Cyanide	1.3	J	1.6		16.3		194		16.9		865			R		R		R
Iron	78600		199000		331000		334000		377000		177000		314000	J	453000	J	146000	J
Lead	4180		7590		28500		5270		24100		31600		7560	J	2410	J	2500	J
Magnesium	2340		1990		1130		1530		991		328		673	J	1010	J	1300	J
Manganese	462		939		1330		1300		1700		728		878	J	2010	J	641	J
Mercury	1.1	J	0.84	J	2.5	J	0.56	J	0.33	J	6.7	J	0.95	J	0.34	J	1.6	J
Nickel	169	J	285	J	1420	J	276	J	607	J	14100	J	175	J	142	J	980	J
Potassium	1170	J	3060	J		R	2270	J		R	4870	J		R	1020	J	645	J
Selenium	1.1	UJ	1.3	UJ	2.0	J	1.9	UJ	3.1	J	1.0	UJ	5.3	J	8.2	J		R
Silver	3.3		5.7		22.1		10.4		3.4		104		3.3	J	1.2	J	10.3	J
Sodium	560	J	5840	J	290	J	2360	J	160	UJ	7870	J	1070	J	3780	J	561	J
Thallium	1.4	UJ	1.2	UJ	1.3	UJ	1.8	UJ	2.4	UJ	16.0	J		R		R		R
Vanadium	33.9	J	15.3	J	34.5	J	57.6		38.0	J	41.3		15.5	J	13.2	J	19.3	J
Zinc	3050		62900		12100		2770		13700		2290		7420	J	11600	J	1670	J

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed; ND Not Detected (aqueous samples, see Appendix A)

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TABLE 4-8b (cont.)
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN DRAIN RESIDUE SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

Sample Number	G32-DR-10		G32-DR-11		G32-DUP4		G32-DR-12		G32-DR-13		G32-DR-14		G32-DUP3	
Date Sampled	4/26/00		4/26/00		4/26/00		4/24/00		4/25/00		4/25/00		4/24/00	
QC Identifier	Field Dup. G32-DR-10		None		Field Dup. G32-DR-10		None		None		None		Field Dup. G32-DR-02	
Matrix	Drain		Drain		Drain		Drain		Drain		Drain		Drain	
Percent Solids	AQ Sample		AQ Sample		AQ Sample		55.9		61.1		28.5		65.3	
Volatile Organic Analysis (UG/KG)														
2-Butanone	ND		ND		ND		21		64	J	47	UJ	79	
Acetone	ND		ND		ND		120	J	150	J	130	J	260	J
Benzene	ND		ND		ND		19	U	13	U	47	U	17	U
Carbon Disulfide	ND		ND		ND		19	U	46	J	45	J	17	U
Chloroethane	ND		ND		ND		19	U	13	U	47	U	7.0	J
Chloromethane	ND		ND		ND		19	U	13	U	47	U	25	
cis-1,2-Dichloroethene	ND		ND		ND		19	U	11	J	47	U	17	U
Ethylbenzene	ND		ND		ND		19	U	2.0	J	6.0	J	17	U
Isopropylbenzene	ND		ND		ND		19	U	4.0	J	47	U	17	U
Methylcyclohexane	ND		ND		ND		19	U	12	J	47	U	17	U
Methylene Chloride	ND		ND		ND		3.0	J	2.0	J	9.0	J	2.0	J
Tetrachloroethene	ND		ND		ND		19	U	40	J	47	U	17	U
Toluene	ND		ND		ND		19	U	7700	*	7.0	J	17	U
Total Xylenes	ND		ND		ND		19	U	14	J	29	J	17	U
trans-1,2-Dichloroethene	ND		ND		ND		19	U	13	U	47	U	17	U
Trichloroethene	ND		ND		ND		19	U	13	U	47	U	17	U
Vinyl Chloride	ND		ND		ND		19	U	5.0	J	47	U	17	U
Semivolatile Organic Analysis (UG/KG)														
1,1'-Biphenyl	1100	UJ	330	J	860	U	6100	U	2800	U	1200	UJ	2700	U
2,4-Dimethylphenol	1100	UJ	1100	U	860	U	6100	U	2800	U	1200	UJ	2700	U
2-Methylnaphthalene	1100	UJ	1200		860	U	1000	J	16000		1200	UJ	2700	U
Acenaphthene	1100	UJ	1800		860	U	4700	J	2800	U	1200	UJ	530	J
Acenaphthylene	1100	UJ	1100	U	190	J	6100	U	2800	U	1200	UJ	2700	U
Anthracene	1100	UJ	6300		180	J	11000		1600	J	240	J	1100	J
Benzaldehyde	1100	UJ	1100	U	860	U	6100	U	2800	U	1200	UJ	2700	U
Benzo(a)anthracene	1100	UJ	15000	*	1200		16000		5200		580	J	2600	J
Benzo(a)pyrene	1100	UJ	8500	*	1200		14000		6300		530	J	2600	J
Benzo(b)fluoranthene	1100	UJ	7500	*	1300		13000		7500		520	J	3500	

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed; ND Not Detected (aqueous samples, see Appendix A)

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TABLE 4-8b (cont.)
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN DRAIN RESIDUE SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND
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Sample Number	G32-DR-10		G32-DR-11		G32-DUP4		G32-DR-12		G32-DR-13		G32-DR-14		G32-DUP3	
Date Sampled	4/26/00		4/26/00		4/26/00		4/24/00		4/25/00		4/25/00		4/24/00	
QC Identifier	Field Dup. G32-DR-10		None		Field Dup. G32-DR-10		None		None		None		Field Dup. G32-DR-02	
Matrix	Drain		Drain		Drain		Drain		Drain		Drain		Drain	
Percent Solids	AQ Sample		AQ Sample		AQ Sample		55.9		61.1		28.5		65.3	
Benzo(g,h,i)perylene	1100	UJ	1900		630	J	3700	J	3000		250	J	2700	U
Benzo(k)fluoranthene	1100	UJ	9000	*	1300		13000		5100		480	J	3800	
bis(2-Ethylhexyl)phthalate	1100	UJ	1100	U	860	U	780	J	1100	J	1200	UJ	2700	U
Carbazole	1100	UJ	3200		860	U	4900	J	2800	U	1200	UJ	540	J
Chrysene	1100	UJ	15000	*	1300		15000		6700		650	J	3400	
Di-n-Butylphthalate	1100	UJ	1100	U	860	U	6100	U	300	J	1200	UJ	520	J
Dibenzo(a,h)anthracene	1100	UJ	1300		310	J	2300	J	1300	J	120	J	2700	U
Dibenzofuran	1100	UJ	2400		860	U	3400	J	2800	U	1200	UJ	360	J
Fluoranthene	120	J	43000	*	1400		46000		12000		1400	J	7700	
Fluorene	1100	UJ	1600		860	U	5500	J	1400	J	1200	UJ	530	J
Indeno(1,2,3-cd)pyrene	1100	UJ	2300		640	J	4000	J	3000		240	J	2700	U
Naphthalene	1100	UJ	3600		860	U	1200	J	2800	U	1200	UJ	2700	U
Phenanthrene	1100	UJ	35000	*	490	J	44000		13000		1000	J	5700	
Pyrene	110	J	33000	*	1100		33000		12000		1200	J	4700	
Pesticide/PCB Analysis (UG/KG)														
4,4'-DDD	11	UJ	11	U	8.7	U	5.9	U	5.3	U	12	UJ	5.4	U
4,4'-DDE	11	UJ	11	U	8.7	U	18		5.3	U	12	UJ	32	J
4,4'-DDT	11	UJ	11	U	8.7	U	34		5.3	U	24	J	55	J
alpha-Chlordane	5.7	UJ	5.3	U	4.3	U	3.0	U	2.6	U	5.9	UJ	2.7	U
Aroclor-1248	110	UJ	110	U	87	U	59	U	53	U	120	UJ	54	U
Aroclor-1254	110	UJ	110	U	87	U	270	J	2300		120	UJ	830	J
Aroclor-1260	110	UJ	110	U	87	U	59	U	53	U	260	J	500	J
Dieldrin	11	UJ	11	U	8.7	U	5.9	U	5.3	U	12	UJ	8.3	J
Endosulfan II	11	UJ	11	U	8.7	U	5.9	U	5.3	U	12	UJ	5.4	U
gamma-Chlordane	5.7	UJ	5.3	U	4.3	U	3.0	U	2.6	U	5.9	UJ	2.7	U
Gasoline Range Organic Analysis (MG/KG)														
Gasoline Range Organics	ND		ND		ND		0.522		57		0.936	J	0.477	J

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed; ND Not Detected (aqueous samples, see Appendix A)

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TABLE 4-8b (cont.)
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN DRAIN RESIDUE SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

Sample Number	G32-DR-10		G32-DR-11		G32-DUP4		G32-DR-12		G32-DR-13		G32-DR-14		G32-DUP3	
Date Sampled	4/26/00		4/26/00		4/26/00		4/24/00		4/25/00		4/25/00		4/24/00	
QC Identifier	Field Dup. G32-DR-10		None		Field Dup. G32-DR-10		None		None		None		Field Dup. G32-DR-02	
Matrix	Drain		Drain		Drain		Drain		Drain		Drain		Drain	
Percent Solids	AQ Sample		AQ Sample		AQ Sample		55.9		61.1		28.5		65.3	
Diesel Range Organic Analysis (MG/KG)														
Diesel Range Organics	123	J	1490		130	J	3600		25900		277	J	10600	J
TAL Metal Analysis (MG/KG)														
Aluminum	5520	J	943		3540		1770	J	2510		1180	J	5970	J
Antimony	13.7	J		R	1.2	UJ		R	26.5	J		R		R
Arsenic	24.9	J	36.0	J	3.2	J	21.1	J	11.0	J	14.3	J	23.7	J
Barium	194	J	120	J	64.5		857	J	108	J	1340	J	1130	J
Beryllium	0.67	UJ	0.18	U	0.43	U	0.11	U	0.21	U	0.32	UJ	0.19	U
Cadmium	67.1	J	39.3	J	30.2	J	46.0	J	16.6	J	73.4	J	64.2	J
Calcium	106000	J	3970	J	52100	J	19400	J	12100	J	18700	J	9090	J
Chromium	133	J	206	J	23.8	J	159		49.5	J	197	J	222	
Cobalt	50.1	J	30.3	J	20.4		18.4	J	11.4	J	21.8	J	25.6	J
Copper	904	J	601	J	299	J	973	J	436	J	322	J	2940	
Cyanide		R	1.5	UJ	1.2	UJ	0.89	U	1.0	J		R	1.6	
Iron	170000	J	605000	J	36900	J	213000		102000	J	250000	J	278000	
Lead	911	J	1300	J	249	J	4300		12700	J	2670	J	7720	
Magnesium	5520	J	3050		3430		2310		1370		31200	J	2010	
Manganese	1160	J	2100	J	582	J	1040		263	J	1360	J	1250	
Mercury	0.22	J	0.38		0.48		0.69	J	0.61		2.6	J	1.8	J
Nickel	132	J	236		44.5		167	J	76.1		228	J	528	J
Potassium	560	J		R	347		826	J	590	J	1110	J	2170	J
Selenium		R	12.2		2.0	UJ	1.4	UJ	1.4	J	3.7	J	1.8	J
Silver	2.8	J	3.4		0.86		2.4		2.6		7.6	J	2.8	
Sodium	203	UJ	794		390		737	J	367		1100	J	3790	J
Thallium		R	2.2	U	1.8	U	1.3	J	1.2	U		R	1.1	UJ
Vanadium	60.8	J	5.2	J	25.2	J	11.4	J	8.5	J	13.9	J	10.0	J
Zinc	8230	J	3610	J	4050	J	2790		1030	J	2200	J	93800	

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed; ND Not Detected (aqueous samples, see Appendix A)

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TABLE 4-8c
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

Sample Number	G32-DUP2		G32-SS-01-06IN		G32-SS-02-06IN		G32-SS-03-06IN		G32-SS-04-06IN		G32-SS-05-06IN		G32-SS-06-06IN		G32-SS-07-06IN		G32-SS-08-06IN	
Date Sampled	4/20/00		4/20/00		4/20/00		4/20/00		4/20/00		4/20/00		4/20/00		4/20/00		4/20/00	
QC Identifier	Field Dup. G32-SS-07-06IN		None		None		None		None		None		None		Field Dup. G32-SS-07-06IN		None	
Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
Percent Solids	68.9		53.1		73.4		29.8		84.6		92.1		83.5		61.7		80.5	
Volatile Organic Analysis (UG/KG)																		
2-Butanone	14	U	28	U	26	U	47	U	9.0	U	11	U	12	J	18	U	13	U
Acetone	75	J	150	J	140	J	140	J	34	J	40	J	74	J	100	J	120	J
Benzene	14	U	28	U	26	U	47	U	9.0	U	11	U	2.0	J	18	U	13	U
Chloromethane	14	U	28	U	26	U	47	U	9.0	U	11	U	5.0	J	18	U	13	U
Methyl Acetate	14	U	20	J	14	J	47	U	9.0	U	11	U	14	U	18	U	13	U
Semivolatile Organic Analysis (UG/KG)																		
1,1'-Biphenyl	65	J	680	U	460	U	1200	U	130	J	360	U	400	U	320	J	130	J
2-Methylnaphthalene	140	J	680	U	460	U	100	J	390	J	360	U	400	U	880	J	440	J
4-Methylphenol	530	U	680	U	460	U	1200	U	400	U	360	U	400	U	600	U	52	J
Acenaphthene	1400		70	J	92	J	750	J	1700		360	U	32	J	6300	*J	1400	J
Acenaphthylene	340	J	680	U	460	U	1200	U	60	J	360	U	34	J	300	J	49	J
Anthracene	3500	*J	130	J	200	J	1400		3400	*J	20	J	90	J	10000	*J	2400	
Benzaldehyde	530	U	680	U	460	U	1200	U	400	U	360	U	400	U	600	U	47	J
Benzo(a)anthracene	12000	*J	410	J	690		4100		8500	*	88	J	600		22000	*J	5300	*
Benzo(a)pyrene	9800	*J	390	J	630		3500		8100	*	85	J	860	J	19000	*J	4800	*
Benzo(b)fluoranthene	10000	*J	450	J	770		3700		6900	*	110	J	1500	J	18000	*J	4000	*
Benzo(g,h,i)perylene	6200	*J	140	J	280	J	1100	J	2900	J	73	J	450	J	14000	*J	1300	
Benzo(k)fluoranthene	9300	*J	360	J	680		3400		6400	*	78	J	1200	J	17000	*J	4500	*
bis(2-Ethylhexyl)phthalate	310	J	680	U	460	U	1200	U	400	U	41	J	400	U	280	J	52	J
Carbazole	2600		81	J	130	J	870	J	1500		360	U	79	J	5800	*J	1600	
Chrysene	14000	*	470	J	810		4400		9200	*	100	J	1000		23000	*	5200	*
Di-n-Butylphthalate	530	U	680	U	460	U	1200	U	400	U	42	J	400	U	600	U	410	U
Dibenzo(a,h)anthracene	2900	*J	88	J	130	J	720	J	1500		360	U	200	J	6600	*J	810	
Dibenzofuran	920		680	U	35	J	410	J	630		360	U	400	U	3300	J	890	
Fluoranthene	30000	*	990		1600		9400	*	20000	*	180	J	560		61000	*J	12000	*
Fluorene	1800		65	J	84	J	750	J	1200		360	U	400	U	5400	*J	1500	
Indeno(1,2,3-cd)pyrene	5900	*J	140	J	270	J	1300		2700		56	J	410	J	12000	*J	1500	
Naphthalene	190	J	680	U	35	J	220	J	1400		360	U	400	U	3500	J	990	J
Phenanthrene	20000	*	680		930		7300		15000	*	83	J	260	J	50000	*J	11000	*
Pyrene	24000	*	830		1500		8400		19000	*	160	J	1300		48000	*J	10000	*J

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

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TABLE 4-8c (cont.)
ANALYTICAL RESULTS - DETECTED COMPOUNDS IN SURFACE SOIL SAMPLES, BUILDING 32 SASE
SITE 17 DRAFT BACKGROUND SUMMARY REPORT
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND
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Sample Number	G32-DUP2		G32-SS-01-06IN		G32-SS-02-06IN		G32-SS-03-06IN		G32-SS-04-06IN		G32-SS-05-06IN		G32-SS-06-06IN		G32-SS-07-06IN		G32-SS-08-06IN	
Date Sampled	4/20/00		4/20/00		4/20/00		4/20/00		4/20/00		4/20/00		4/20/00		4/20/00		4/20/00	
QC Identifier	Field Dup. G32-SS-07-06IN		None		None		None		None		None		None		Field Dup. G32-SS-07-06IN		None	
Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
Percent Solids	68.9		53.1		73.4		29.8		84.6		92.1		83.5		61.7		80.5	
Pesticide/PCB Analysis (UG/KG)																		
4,4'-DDT	5.3	U	6.9	U	6.2	P	12	P	17		5.5		5.4		6.0	U	6.6	
Aroclor-1254	4000	*	69	U	110		120	U	39	U	37	U	42	U	5800	*	43	U
Gasoline Range Organics (MG/KG)																		
Gasoline Range Organics	0.664		0.55	U	0.44	U	1.0	U	0.283		0.23	U	0.27	U	0.407		0.257	J
Diesel Range Organics (MG/KG)																		
Diesel Range Organics	558		123		410		490		371		364		553		734		94.2	J
TAL Metal Analysis (MG/KG)																		
Aluminum	1950		3480		6920		3840	J	11400		5820		4880		1750		6590	
Antimony	93.0	J	0.94	UJ	0.68	UJ	1.8	J	0.59	UJ	1.7	J	8.7	J	106	J	0.62	UJ
Arsenic	13.9		1.9	UJ	5.9		6.6	J	16.8		3.5	U	9.6		16.4		2.8	U
Barium	203		21.1		39.4		113	J	21.2		20.3		200		352		18.7	
Cadmium	38.1	J	2.3		9.9		511	J	1.4	J	2.6	J	8.1	J	51.8	J	1.7	
Calcium	10500		5420		642		16800	J	2440		1140		2010		12400		1300	
Chromium	79.8	J	7.4		67.3		86.8	J	21.3	J	14.1	J	48.2	J	86.7	J	12.1	
Cobalt	6.8		3.0		9.0		7.8	J	12.5		6.0		11.4		7.6		4.5	
Copper	112	J	27.8		413		146	J	36.3	J	94.0	J	287	J	121	J	26.6	
Cyanide	1.6		0.94	U	0.68	U	2.6	J	0.59	U	0.54	U	0.60	U	0.81	U	0.62	U
Iron	98200		7790		20700		17000	J	33000		25000		97600		113000		14900	
Lead	3140		35.8		225		337	J	106		292		1950		2710		112	
Magnesium	1010		1550		1890		1640	J	3800		2600		2490		767		2600	
Manganese	460		240		142		475	J	399		193		494		461		124	
Mercury	0.04	UJ	0.08	UJ	0.04	UJ	0.45	J	0.02	U	0.04	UJ	0.17		0.05	UJ	0.04	UJ
Nickel	33.3	J	9.2		23.5		64.3	J	24.6	J	13.4	J	47.8	J	44.7	J	13.1	
Potassium	305	J	485	J	429	J	551	J	385	J	655	J	773	J	236	J	928	J
Selenium		R	2.8	J	1.7	J	3.4	J	0.90	U		R		R		R	0.97	J
Silver	0.76	J	0.24	UJ	0.26	UJ	0.82	J	0.12	UJ	0.11	UJ	0.75	J	0.85	J	0.12	U
Vanadium	45.9		11.5		25.8		41.3	J	18.0		14.7		25.7		44.6		63.5	
Zinc	4430		60.2		129		2140	J	205		231		1310		4990		43.6	

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; NA - Not Analyzed

5.0 DEMOLITION AND PCB INVESTIGATIONS

5.1 BUILDING DEMOLITION

Due to the deteriorated condition of the buildings at the site, the Navy undertook demolition and removal of the building overhead structures. Work on the demolition commenced in the spring of 2000, and continued until fall 2002. The demolition consisted of asbestos abatement, removal of building equipment and components, and demolition of buildings to the slab elevation only. The following buildings were demolished in this manner:

- Building 32 - Torpedo Overhaul Shop
- Building 33 - Steam Plant
- Building 34 – Acetylene Generator Building
- Building 35 (South) – Support for Torpedo Firing Pier
- Building 70 – Quonset Hut
- Building 52 - Riggers Storage Building
- Building 59 - Switch House/Transformer Vault
- Building 58 - Deep Well House
- Acid Storage Shed
- Buildings 53, 54, 56, 60, 61, 62 – Transformer Vaults

In addition, in 2000, the docks and piers that were in ruins at the shoreline were removed as they presented a navigation hazard. Removal of these structures involved dismantling the remaining above water structure, then cutting the pilings at grade. The following structures were removed in this manner:

- "T" Dock
- Ferry Dock
- Saltwater Intake Pier

During building demolition, concrete samples were taken from the interior floor and walls of the transformer vaults and the switch house to determine disposal options for the material. The results of this sampling indicated PCB contamination in some of the floor samples. Due to this finding, additional PCB investigations were conducted after building component removal. Details on the demolition and disposal of the buildings at Gould Island, conducted by Foster Wheeler Environmental Corporation (FWENC) are pending publication by FWENC.

5.2 PHASE 1 PCB SAMPLING (FOSTER WHEELER, 2002)

During building demolition, concrete samples taken from the interior floor and walls of the transformer vaults and the switch indicated PCB contamination in some of the floor samples. Therefore, FWENC initiated a first phase of PCB investigations to confirm the location of existing PCB contamination and determine the horizontal and vertical delineation of the PCB contamination in soils under the buildings, and in the concrete roadways and soils near those buildings. This first phase involved the concrete roadways, and transformer vaults (TRVs) 53, 54, 56, 59, 60, and 61, and the area around the Riggers Storage Building 52. An interim cleanup goal of 10 mg/kg was used to delineate action areas where excavations were conducted under Phase 2 (Section 5.3 of this report). Appendix C provides excerpts from the Foster Wheeler Draft Phase 1 Sampling Report for the Characterization of PCB Contaminated Soils and Concrete at Gould Island. Figure 4 in Appendix C shows Phase 1 grid sample stations.

PCB sampling was conducted in accordance with The Navy Installation Chemical Data Quality Manual and the Region I USEPA – New England Compendium of Quality Assurance Project Plan Guidance. The sampling and analysis effort involved screening (immunoassay) and laboratory confirmation analysis. Screening data was initially generated using immunoassay testing, with a minimum of 10% confirmed using EPA approved reference methods. Later analysis was all performed using EPA methods reference number 3550 or 3545 and 8082. A limited number of samples were taken using an extended suite of analytical methods, including analysis for VOCs, SVOCs, and TPH.

Samples were taken of debris, concrete, water, wastewater, and soil. Concrete samples were taken from the top one-inch of concrete on the surface of interest. In some locations, deep concrete was also collected, as the lowest one-inch of concrete dust in the component. Soil samples were taken below and around the transformer vault foundations using direct push instruments, at one foot intervals to a depth of two feet below the groundwater level, or two feet below the bottom of the transformer vault, whichever was deeper. At Building 54, sediment samples were collected as the sediment was within one of the grid areas.

Based on the findings of the grid sampling, additional samples were collected in some locations. This approach was based on TSCA rules and agreements with EPA and RIDEM representatives familiar with the project. Sample locations were surveyed to record location data.

Interim action goals were set at 10 mg/kg PCB in most locations, and 1 mg/kg in areas adjacent to the former Building 54 transformer vault, due to its proximity to the shoreline. Data from the Phase 1 study are summarized in Appendix C, Table C-1 (Concrete Sample Analysis) and C-2 (Soil Sample Analysis). Much of the concrete and underlying soils in the roadways analyzed for PCB content had undetectable concentrations, or had PCBs below the action levels, with the exception of the concrete roadway at the riggers storage building (Building 52) and the roadway near Buildings 56 and 59.

Soil testing under the building foundations was also conducted if PCBs were detected in the concrete overlying those soils. In this manner, some concrete and soils at Buildings 52, 54, 56, 59, and 61 were delineated for later removal from the site.

Concrete and soils with PCBs in excess of the interim cleanup goals were removed from the area and disposed of as TSCA waste as a part of Phase 2 PCB removals (Section 5.3 of this report).

5.3 PHASE 2 PCB CONTAMINATED CONCRETE AND SOIL REMEDIATION (FOSTER WHEELER, 2002)

Phase 2 of the PCB Removal Actions involved actual removal and disposal of the contaminated concrete and soil delineated as described in Section 5.2 of this report. The removal actions have taken place to remove the soils and concrete with concentrations of PCBs in excess of the interim cleanup goals of 10 mg/kg PCB in soil and concrete, and 1 mg/kg in sediments near Building 54. This section describes the removal actions at each area in more detail.

- Concrete Roadways – The concrete roadways throughout the site were sampled as described in Section 5.2. Some sections where PCBs were not detected were removed and disposed of offsite as construction debris. Samples collected from other areas of the concrete roadways near Buildings 54, 56, 59 and 52 showed PCBs in excess of the interim cleanup goal, and these concentrations triggered additional sampling and delineation of removal areas of concrete and underlying soils.

- Building 54 – Concrete samples taken from the floor of this building found concentrations of PCBs (320 mg/kg) in excess of the interim cleanup goal, although the walls did not (2.1 mg/kg). The walls and roof were removed and used as backfill in the Building 44 UST removal area. The floor-slab was removed and disposed of off site as TSCA waste. The small basement area contained a small amount of water and oil that was removed and disposed of as TSCA waste. The foundation and soils underneath were removed to the approximate depth of the foundation. A single sample from the bottom of the excavation indicated PCBs present at concentrations above the interim cleanup goal, and thus a series of borings were performed in the former building foot print, and around the former building. These borings were used to delineate the Phase 2 removal action area.

- Building 56 – Concrete samples taken from the floor slab of this building (270 mg/kg) exceeded the PCB interim cleanup goal. The walls (0.9 mg/kg) did not exceed the criteria, so the material was removed and used as backfill in the Building 44 UST removal area. The floor slab and foundation were removed and disposed of as TSCA waste. Additional concrete samples from the north (roadway) side of Building 56 showed PCBs in excess of the interim cleanup goal also, and additional samples were taken to define the removal action area in this location.

- Building 59 - Concrete samples taken from the floor slab of this building (73 mg/kg) exceeded the PCB interim cleanup goal. The walls (2.9 mg/kg) did not exceed the criteria, so the material was removed and used as backfill in the Building 44 UST removal area. The floor slab and foundation were removed and disposed of as TSCA waste. Additional concrete samples from the north (roadway) side of Building 59 showed PCBs in excess of the interim cleanup goal also, and additional samples were taken to define the removal action area in this location.

- Building 60 - Concrete samples taken from the floor slab of this building (10,000 mg/kg) exceeded the PCB interim cleanup goal. The walls (0.2 mg/kg) did not exceed the criteria, so the material was removed and used as backfill in the Building 44 UST removal area. The floor slab and foundation were removed and disposed of as TSCA waste. Additional concrete samples from the north (roadway) side of Building 60 showed PCBs in excess of the interim cleanup goal also, and additional samples were taken to define the removal action area in this location.

- Building 61 - Concrete samples taken from the floor slab of this building (3,000 mg/kg) exceeded the PCB interim cleanup goal. The walls (0.2 mg/kg) did not exceed the criteria, so the material was removed and used as backfill in the Building 44 UST removal area. The floor slab and foundation were removed and disposed of as TSCA waste. Additional concrete samples from the north (roadway) side of Building 60 showed PCBs in excess of the interim cleanup goal also, and additional samples were taken to define the removal action area in this location.

As of the press date of this Background Summary Report, a report has not been made available that describes the excavations and confirmatory sampling at the site near the buildings listed above. However, data from confirmatory sampling after planned removals has been made available and is provided as Table C-3, Appendix C. Based on these data, it appears that excavations were continued in each area until the action level of 10 mg/kg PCB was met. Therefore it is likely that PCBs remain in the soils at concentrations that are below 10 mg/kg at these locations, and in the Building 44 UST removal action area, as described above.

6.0 SUMMARY

The following presents a brief summary of environmental media and areas of the site known or suspected to contain oil or hazardous materials.

6.1 GROUNDWATER CONTAMINATION

Based on studies performed to date, groundwater appears to contain low concentrations of petroleum, chlorinated solvents, PAHs, and metals. Low concentrations of these contaminants are currently known to exist in the area of former Building 44, and the open areas to the west. Traces of petroleum hydrocarbons may be found in the groundwater south of Building 32 as well, in the area of the former 1000 gallon UST.

Groundwater appears to have a northeastern flow direction, although measured head differences are slight, and tidal fluctuations are likely in this area.

6.2 VADOSE ZONE CONTAMINATION

Based on The Quad 3 Group study in 1997 and the TtNUS SASE study performed in 2000, it is anticipated that there are chlorinated solvents, toluene, and PAHs under the existing slab foundation for Building 32, and also to the north as far as the firing pier. This is consistent with the former use of the building, materials likely to have been used at the site, and history of operations at the site.

6.3 SOIL CONTAMINATION

Based on the PCB sampling efforts conducted by Foster Wheeler in 2001 and 2002, it is apparent that there are soils present containing PCBs at concentrations below 10 mg/kg at the former locations of Buildings 52, 53, 54, 56, 59, 60, and 61.

6.4 SEDIMENT CONTAMINATION

Based on historical records, piping configurations and sampling of sediment and mussels conducted in the 1980s, electroplating fluids were likely to have been discharged to Narragansett Bay, in the subtidal area to the east of Building 32. Additionally, it is likely that chlorinated and non-chlorinated solvents from the degreasing operations conducted in Building 32 may also have been discharged in that area. The subtidal environment at this location is highly active, exposed to the north, south and east. The discharge pipes have rotted away, and there is very little depositional sediment present. There is an apparently healthy epibenthic ecosystem in place that is typical for Narragansett Bay.

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